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Copies of the Year Book, Regulations, and Candidates' Certificates may be had on application at the Society's House, 1, Savile Row, London, W.

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The

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No. 1. JULY, 1903. Vol. XXII.

ADDRESS TO THE ROYAL GEOGRAPHICAL SOCIETY, 1903.*

By Sir CLEMENTS R. MARKHAM, K.C.B., F.R.S., President.

It is, I think, very satisfactory to find that the Society, year by year, continues to flourish and to increase the number of its members; and that, in spite of the diminution of income caused by our large grant to the Antarctic Expedition, our means of usefulness have not been materially reduced. I feel very strongly that our flourishing condition is due, in no small measure, to the efficiency and excellence of the Society's staff; and, first and foremost, to the admirable way in which the *Journal* is edited by our Secretary. The new series has now reached its twentieth volume, covering the period from 1893 to 1903. In my anniversary address for 1894, I was already able to record that it was quoted everywhere; that it was favourably noticed by the principal organs of the press; and, above all, that it was highly commended by the celebrated German geographer Baron von Richthofen, than whom there is no better judge. Since that time the *Journal* may truly be said to have improved from year to year. It is now the chief repository of geographical information from all parts of the world. It contains original maps, such as that of the Congo and those of the Kangchenjunga, of the utmost value; and the numerous illustrations have largely increased its popularity and usefulness. Such excellence could not be reached without corresponding expenditure; but this is met, to some extent, by receipts from advertisements. The Society owes the high position held by our *Journal* to the ability and untiring labour of its accomplished Secretary, Dr. Scott Keltie. As for his other work for the Society, there are few Fellows who have not personal knowledge and experience of his unfailing courtesy, his indefatigable industry, and his sound judgment in all matters relating to our work. The Council places the highest value on the way in which the Society's business is conducted by Dr. Keltie; and for myself personally I can say with truth that the President is relieved of half his labours, and of all his anxieties, by the perfect confidence he is able to place in the ability and zealous work of the Secretary. Dr. Keltie enters upon every new project for the advancement of geography and for the increased usefulness of the Society's operations with an amount of zeal and intelligence that cannot easily be surpassed. It is, however, only those who are daily working with him that can know the full extent of the good that he accomplishes.

---

* Read at the Anniversary Meeting, May 18, 1903.

The Society is, at the present time, very fortunate in having the services of such an excellent staff. In Mr. Heawood we have a librarian who possesses no ordinary knowledge of geographical literature, and who takes a keen interest in completing our library and in making it as useful and accessible as possible to the Fellows. Mr. Reeves has had an experience of our map-room extending over a quarter of a century. His qualifications as curator are, therefore, unequalled. But it is for his success as an instructor that the Society is most indebted to him. Mr. Reeves combines a profound knowledge of his subject with rare gifts of exposition, and I hear on all hands that his system of instruction gives the greatest satisfaction to those who benefit from it. The number of students has greatly increased. During the past year sixty-four students have passed through Mr. Reeves' hands, and four have succeeded in obtaining the Society's diploma. Mr. Evis, our chief clerk and accountant, has now been in our service for thirty-seven years, and has held his present post for twenty years. I have always looked upon him as a model of efficiency, and as one in whom the most complete reliance can be placed.

Our service is liked, and members of our staff do not care to leave it. One of them has served us for upwards of fifty years. The junior members of it are efficient and zealous, and all pull well together. I have been struck by this on several occasions. Quite recently, on the occasion of our Elizabethan Exhibition, all the arrangements were ably and admirably conducted, without a mistake, with excellent taste, and without a complaint.

In my address last year I referred to the action taken by the Council, in resolving that there should be a Special Education Committee to deal with communications from the London School Board and the Oxford and Cambridge Local Examination Board. This committee has considered the subject of geographical education at several sittings, and has drawn up two syllabuses for the guidance of teachers of geography, one dealing with elementary education, and the other with secondary education. It is hoped that these syllabuses will be issued shortly, and that they will tend to place our science on a clear and satisfactory basis both in elementary and secondary schools.

In other directions during the past year evidences of the increasing interest in geography as an educational subject have been manifest. Urgent inquiries are received at the Society's rooms as to where good geographical teachers can be found, or asking for guidance or advice as to methods and appliances, maps and text-books. It is to be hoped that in the re-organization of education, which is on foot in this country, provision for the adequate training of teachers in geography will be made, as is the case with other subjects. More than one of our public schools is known to be equipping itself for the more thorough teaching of geography by the purchase of orographical maps, and in other ways. It may further be noted, as a sign of the movement in progress, that a course of lectures on the teaching of geography was recently delivered in Leeds, at the instance of the West Riding County Council, and was attended by more than eight hundred experienced teachers from secondary and primary schools.

The position of geography in the Universities continues to be hopeful. The arrangements for the school at Oxford are in all respects satisfactory, and there at last we see our long-continued efforts bearing fruit. At the regular courses, during the past year, there has been an attendance of nearly one hundred and fifty students. In addition, a most successful vacation course has been held, which was followed by more than twenty teachers, nearly all graduates. A "certificate in geography" has been established by the University to meet the needs of those who cannot spare the time required for a Diploma. There is now a distinct prospect of an important step forward being taken at Cambridge. On this I cannot say more at present, but I am not without hope that before the close of the year geography at Cambridge will at last be on a satisfactory footing. The Reader at Cambridge, Mr. Yule Oldham, has, meanwhile, given courses of lectures on the geography of Europe, showing the influence of physical features on national development, which were attended by thirty students in the Michaelmas and forty-one in the Lent term. He has also given lectures on the principles of physical geography, less numerously attended, and on the history of geographical discovery. Altogether he had over ninety students attending his lectures during last term. Mr. Yule Oldham has also organized fortnightly evening meetings, on the model of a German "Colloquium," at which original papers have been read by selected students.

I was able to report to you last year that geography had been placed on a proper footing in the reconstituted University of London. Among other arrangements, it has been included in the optional subjects in the matriculation examination. The programme of the subjects for this examination was in every respect satisfactory, placing geography on a level worthy of a university. The first examination has been held under this programme, and the paper was a stiff one. The number of candidates was sixty-six, but the result was not altogether satisfactory, though not surprising on the first beginning; for the examination made a demand on powers of observation and reasoning to which pupils in this country have not been accustomed. There is every reason to expect that, in time, both teachers and pupils will rise to the standard. In the London University large classes have attended the geographical courses at the School of Economics, one of them containing nearly twenty graduates. The first intermediate examination for the degree of B.Sc. in economics is about to take place, with geography as one of the obligatory subjects.

It will be remembered that in 1894 I introduced the plan of printing, with the general list of Fellows, a list of those who have read papers, published books, or are known to have a special knowledge of any department of our science, which I called a List of Referees, because papers or questions can be advantageously referred to them for report. This list has annually been corrected and revised. It was thought that it would be the ambition of younger Fellows to qualify themselves for inclusion in the list; and in other ways I hoped that the plan would have a tendency to draw the Fellows more together, and into nearer touch with the Council. This has been the case to some extent, but not to the extent I hoped.

With a somewhat similar intention, I instituted the plan of having afternoon meetings in our map-room, for the reading and discussion of strictly scientific or technical papers at a time and place where there could be special audiences and full discussions. The afternoon meetings were commenced in November, 1894, and twenty-three papers have since been read. Some of them, such as Prof. Rücker's on terrestrial magnetism, Dr. Gregory's on the age of the Atlantic, Mr. Vaughan Cornish's on the formation of sand-dunes, Sir John Farquharson's on the Ordnance Survey, Mr. Bernacchi's on the great ice-barrier, and those by M. Elisée Reclus, were important, and were followed by interesting discussions. The plan proved to be useful and capable of further development, and I think that the time is now ripe for organizing and systematizing these afternoon meetings with a view to the promotion of geographical research in various directions, under the supervision of those who would be best qualified to undertake such a task.

From the commencement of our Society its Councils have maintained that the field of geography embraces, not only expeditions for discovery and exploration by sea and land, but also research in various directions, both in the study and in the field. Any one looking back through the volumes of the old *Journal* and *Proceedings* will find not a few papers dealing with investigations, as distinguished from exploration. Our traditions, therefore, authorize us to give special encouragement to geographical research, both in its purely scientific and in its practical aspects.

Mainly through the continued activity of the Society during the last twenty-five years, a school of young geographers has grown up, who are carrying out researches in various departments of our science, and who are thus helping to raise the standard of geography in this country. It seems the duty of the Society to do what it can to encourage work of this kind, and to invite those who are taking part in it to lay their results before the Society. This has, hitherto, been done to some extent at the afternoon meetings, and it is now only necessary to introduce a more organized procedure, so that there may be a regular supply of suitable papers. If the meetings are arranged at fixed dates, it will be possible to obtain an audience capable of discussing each subject that is brought forward.

A permanent committee has now been appointed to deal with this department of the work of the Society, to be called the "Research Committee." It will consist of those Fellows, taken from the List of Referees, who are most interested in, and best qualified to deal with, the subjects which are embraced in geographical research, as distinguished from exploration, in all its numerous branches. It is intended that the committee shall be a large one, and shall include the more distinguished students and men of science among our Fellows, as well as the members of our Council *ex officio*. The committee will meet for the discussion of such results of investigation as may be brought before them; and the Council may be able to set apart a moderate sum each year for the purpose of encouraging such researches among the younger geographical aspirants.

Among the numerous lines that research may take, the following have been suggested :—

New methods of surveying, mapping, or computing,

Discussion of a definite problem of geomorphology (*e.g.* analysis of a river system or a coast-line).

Discussion of a definite problem of hydrography (*e.g.* circulation of water in a restricted sea area).

Discussion of a definite problem of meteorology (*e.g.* modifications of general weather conditions by local features).

Regional studies (*e.g.* synthesis of the geography of a county or of a natural unit such as the Fens).

Investigation of distribution (*e.g.* of some crop in relation to natural facilities and access to markets; of former forests in relation to existing boundaries; of village and town sites in a district).

Mapping of distribution of plant associations in a given area, or of a human disease in relation to climate and soil.

History of the map of some country (*e.g.* the British Isles).

Investigation of evidence of physical changes within historical times (*e.g.* the British coasts; the desiccation of continents).

Discussion of the relation of land forms to military movements in a selected area, or a chosen campaign.

Discussion of the relation of land forms to the distribution of man; to the distribution of animals in any area.

Geographical conditions affecting the development and colonization of any given region.

Complete investigations from the geographical standpoint of a limited area of unexplored or partially explored territory.

There is still ample room for exploration and expeditions of discovery. We have scarcely yet laid down the great lines of the world's geography, and there is work for generations to come in filling in the details, though future exploration must become more and more exact and scientific in its character. But we ought also to encourage research, for which exploration furnishes the raw material. By the plan now in contemplation, we shall develop the purposes of the List of Referees by constituting the Research Committee; and we shall develop further the object of the afternoon meetings by promoting research, the results of which will place the meetings on a more assured and regular system, by creating the necessity for their being more frequent and at fixed intervals.

Turning from our own efforts for the advancement of geography, to the labours of our associates and friends in the field during the past year, I would first refer to the expedition under our Vice-President, Sir Thomas Holdich, from which many interesting and important results may be expected. Last year Sir Thomas went for a second time to the Patagonian Andes in connection with the delimitation of boundaries between the Argentine Republic and Chile. We may expect to have an account of the results of his researches at one of our meetings next session. Our associate, Mr. Hanbury, has lately returned from an exploration along the arctic shores of North America, and in the inhospitable region to the south. He has brought back much valuable material. The devastating eruptions in the West Indies afforded an opportunity for investigating volcanic phenomena, of which excellent advantage was taken by Dr. Tempest Anderson and Dr. Flett. The results were given to the Society during the present session.

In Africa the explorers of all nations are as busy as ever. I may make special reference to the geodetic expedition led by Dr. Rubin, under the supervision of Sir David Gill, which is to carry the measurement of a meridian north from the Zambezi. Another important expedition in Africa was that of M. du Bourg de Bozas, which has been doing admirable work in the Nile region, and was making its way westward to the Atlantic when its accomplished but unfortunate leader died. In Asia and in Australia the work of exploration is being carried out with increasing activity, and with more and more attention to scientific method.

Oceanography is attracting increased attention. The International Council for the investigation of fishery and other problems is superintending excellent work in the North sea and the Atlantic. Prof. Agassiz may be said to have completed his many years of research of coral islands and coral reefs. The results are being published in a series of handsome volumes, most creditable to the public spirit and scientific knowledge of the accomplished professor. The committee appointed at the last International Congress on the terminology and nomenclature of sub-oceanic forms met recently, and the results of their deliberations will doubtless be of service to students.

In our own country the survey of the lakes of Scotland, carried out by the joint enterprise of Sir John Murray and Mr. Lawrence Pullar, has been making rapid progress; and it is hoped that the first result, in the form of maps and reports, will be given in our *Journal* in the course of a month or two.

We now come to the two most memorable events of the past year, and of many past years, one in the far north, and the other in the far south.

Captain Sverdrup, in completing our knowledge of the Parry archipelago, has also completed our general knowledge of Arctic geography. It is this completeness which is the distinguishing feature of his great achievement. In Nansen's famous vessel the *Fram*, he left Christiania in 1898, and continued his operations for no less than four years and a quarter. He had with him a party of a dozen resolute, capable, and able-bodied explorers, including three men of science, a naval officer, and a cavalry officer who was a good surveyor. Sverdrup is an experienced Arctic voyager, a thorough seaman, a man of great resolution, an excellent organizer, and a good comrade. His people worked well with him, and in harmony with each other to the end. The consequence was that he succeeded in completing a fine piece of geographical work, for which he and his gallant companions deserve our highest commendation.

Sverdrup's original object was the exploration of the northern shores of Greenland, but very unfavourable seasons prevented him from proceeding up Smith Sound.* He, however, cleared up the question respecting Hayes Sound, which was still doubtful, and proved that it was a bay. His parties crossed the land to the westward by two routes. He then turned his attention to the region for which Jones Sound is the opening, where his great success awaited him.

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* The land which is divided from Greenland by Smith Sound forms a long island, and as many as seven names have been given to various parts of it—

1. North Lincoln.
2. Ellesmere Land.
3. King Oscar Land.
4. Schley Land.
5. Arthur Land.
6. Grinnell Land.
7. Grant Land.

It is a geographical necessity that, for purposes of description, there should be a name for the whole island. It was first discovered by Baffin in 1616, and first named Ellesmere by Inglefield in 1853. Its name should, therefore, be Ellesmere Island.

The northern coasts of the islands whose southern coasts were first seen by Sir Edward Parry in 1819 were discovered by Sherard Osborn and Richards in 1853, while Prince Patrick Island, the westernmost of all, was explored by McClintoch and Mecham in the same year. The northern coast of Ellesmere Island was discovered by the present Admiral Aldrich in 1876. There remained a wide gap between Prince Patrick Island and Aldrich's furthest, which could be approached by Jones Sound. Owing to the light character of the ice on the northern shores of North Devon, Bathurst and Melville Islands, and to islands, which were named Findlay and North Cornwall, having been seen to the northward, we always assumed that there must be yet more land to the northward. On the northern coast of that land we expected that there would be heavy ice-pressure, similar to that seen on the north coast of Ellesmere Island and on the western coasts of Banks and Prince Patrick Islands. Thus the discovery of what is contained in this wide gap between Prince Patrick Island and Aldrich's furthest would complete our knowledge of the Parry Archipelago, the most interesting part of the Arctic Regions, and would complete our knowledge of the line of mighty ice-pressure from the polar ocean, extending from Point Barrow to the east coast of Greenland.

This great geographical achievement has been done by Captain Sverdrup and his gallant companions. He has discovered both shores of Jones Sound westward of the furthest point reached by Sir Horatio Austin in 1851. He has discovered the whole of the western side of Ellesmere Island, with its numerous deep fjords, the shores of some of which are of great geological interest. His most northern point was within 40 miles of Aldrich's furthest. He discovered a long island separated by a strait from Ellesmere Island, which he named Axel Heiberg, after one of the munificent promoters of the expedition. His comrade, Gunnar Isachsen, discovered the two large islands which we assumed to exist north of Bathurst Island, extending westward beyond the meridian of the eastern coast of Melville Island. They were named the Ringnes Islands, after the two other promoters of the expedition. The expected heavy ice was pressing on the northern coasts of the newly discovered lands.

The discoveries were made by means of dogs over ice suitable for dog-sledging, and with abundant fresh food.

The gap, which I had longed to see undertaken, has thus at length been filled up. On either side are the English discoveries with English names, while wedged between them are the Norse discoveries and the Norse names in the gap, names reminding us of the old West Bygd and East Bygd of Greenland. This interlacing of Norwegian and English discoveries, and of Norwegian and English names, is emblematic of kindred origins, and of the close ties of friendship uniting the two nations.

I repeat that one of the great merits of the work of Sverdrup and his gallant companions is its thoroughness and completeness. It was no small pleasure to me that it became my duty to present Sverdrup with the royal medal, while his accomplished comrade Isachsen has received one of our awards.

We are at last able to contemplate the vast Parry Archipelago as a whole. It is a region of great interest, from many points of view. Opposite to the west coast of Greenland, separated by Baffin's Bay and Smith Sound, there are three Islands of considerable size—Baffin Island, North Devon Island, and Ellesmere Island. The eastern sides of these islands are composed of primitive rock, are glaciated, and resemble Greenland in several respects. But to the westward there is a great change, where a vast area is covered by the Parry Archipelago, consisting of fourteen large islands, many small islands, and a peninsula. To the south there are three large islands separated by straits from the North American Continent, namely, Banks Island, Wollaston Island,* and King William Island. The Boothia Peninsula may be included. Then come Prince of Wales and North Somerset Islands. Occupying a central position are North Devon, Cornwallis, Bathurst, Byam Martin, Melville, Eglinton, and Prince Patrick Islands. To the north are the Ringnes and Axel Heiberg Islands.

These islands differ from the Greenland region in having no glaciers. There must be much less precipitation, and all the meteorological conditions are of very special interest. Their geological formations are even more interesting. In some parts there are extensive Silurian beds very rich in fossils, then Carboniferous sandstones with coal, and limestones. The Mesozoic period is represented by Liassic saurians and other fossils, and the Tertiary by a rich fossil flora in the northern part of the area. One interesting problem is connected with the remains of trees—large trunks which have been found in Banks and Prince Patrick Islands, as well as in the western fjords of Ellesmere Island. Authorities differ respecting their origin: Sir Roderick Murchison was inclined to the view that they were driftwood, others maintain that the trees grew *in situ* at a comparatively recent period, while Mr. Schei of the Sverdrup Expedition thinks that the tree-trunks belong to the Tertiary period. There are many other problems in the geology and physical geography of the archipelago of great interest, especially those relating to the granite boulders far from their original sites, to the different levels of the land, to the character and depth of the channels, the ice-movements and currents, and the position of the still water where the tides of the two oceans meet. The fauna and flora are dependent largely on the character of the rock formations, and the amount of precipitation, as regards distribution, and this is another subject of study. Then there is the mysterious people who, at some remote period, traversed the whole archipelago except the extreme outer western and northern shores, and left numerous vestiges. Here, too, are the scenes of the most famous deeds of Arctic exploration. The greatest voyage with the aid of steam was made by the *Alert* under Sir George Nares; for she alone has battled with the palæocrystic ice, and thus wintered further north than any other ship ever has, or probably ever will, apart from the *Fram* drifting. But the greatest voyages of sailing ships among the ice of the Arctic Regions were undoubtedly those of Parry in 1819–20, and Franklin in 1845–46. In the Parry Archipelago, too, the greatest feats of Arctic sledge travelling have been performed. Here McClintock and Mecham, without the aid of dogs, were away 105 and 94 days, and went over 1328 and 1163 miles respectively. Here Mecham went over 1336 miles at the rate of 20 miles a day. Such work as this has never even been approached in any other part of the north, and I do not think that it ever will be. These journeys would have taken the explorers from Cape Fligely to the north pole and back with ease, and without the aid of dogs.

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* This island, like Ellesmere Island, has suffered from a plethora of names. One part is called Prince Albert, another Victoria, another Wollaston. A name for the whole island is a geographical need, and it seems to be best entitled to that of Wollaston Island.

Thus the Parry Archipelago, from many points of view, presents subjects for study of the greatest interest. Now that Sverdrup's discoveries have completed the work in the field, the raw material is all collected, and offers a splendid subject for geographical research.

Captain Peary has, in the face of extraordinary difficulties, succeeded in reaching the extreme northern point of Greenland, the most northern land in the world, in 83° 20′, and even travelled for three days to the south east. This completes another important Arctic discovery. Baron Toll is still engaged on his work of exploration to the north of Siberia.

The whole problem of Arctic geography has now been solved. There are many isolated pieces of work that I should like to see undertaken. One of them has been entered upon by Captain Amundsen, who is just about to commence his daring voyage, in a very small vessel, to the north magnetic pole. Our Council has had pleasure in subscribing to his fund. Others may be attempted in future years. But there are none which would justify the despatch of an expedition on a large scale.

We will give our final attention to the Antarctic Regions, and, before referring to our own great work—which, indeed, will require a separate address to the Fellows of the Society—we must turn to what is being done in the Weddell and Enderby Quadrants.

I had the great pleasure of wishing Dr. Otto Nordenskiöld God-speed when he started on his expedition on October, 1901. The *Antarctic*, with that experienced polar navigator Captain Larsen in command, finally left Falmouth on October 26. She visited the Argentine magnetic observatory on Staten Island on January 6, 1902, and sighted one of the South Shetland Islands on the 11th. From the 12th to the 21st of February, 1902, the *Antarctic* was engaged in landing Dr. Nordenskiöld and a small party at the northern end of Graham Island at Admiralty Inlet, Snow Hill Land, south of Cockburn Island (Louis Philippe Land). Here he wintered, and intended to do some sledging work in the spring, but he was 250 miles north of the antarctic circle, by the coast. The *Antarctic* was back at the Falkland Islands by March, and visited South Georgia in the winter. In February, 1903, it was expected that the ship, after returning to the winter quarters and taking Dr. Nordenskiöld and his party on board, would return to the Falkland Islands. But she has not appeared, and some anxiety is felt in consequence. I understood that it is intended to send out a relief ship. I most sincerely trust that all may yet be well with the gallant Swedish explorers.

Mr. Bruce completed his arrangements for an expedition into the Weddell Quadrant last year. He purchased an old Norwegian whaler named the *Hecla*, built in 1872, 139 feet long by 29, and of 355 tons burden, at Sandefjord. I had twice inspected her, and found that she would require very extensive repairs before she could be made fit for ice-navigation. These, it is understood, she has received in the Clyde, and her name was changed to the *Scotia*. Captain Robertson, an experienced whaling captain, is in command, and Mr. Bruce is leader of the expedition. The scientific staff consists of Mr. Mossman, meteorologist; Dr. Pirie, surgeon and geologist; Mr. Rudmose Brown, botanist; and Mr. Brown and Mr. Wilton, zoologists. They are well supplied with dredging-gear and deep-sea sounding apparatus. After a satisfactory voyage to the Falkland Islands, they left Port Stanley on January 25, intending to reach the pack edge on the 30th western meridian, and follow, if possible, the track of Captain Weddell. This was not found possible by Sir James Ross, but seasons vary exceedingly. I am not aware of Mr. Bruce's grounds for expecting to find a comfortable harbour in that direction, But I have already expressed my views when I discussed the routes for Antarctic Expeditions. Weddell, on February 20, 1823, went as far south as 74° 15′ without meeting with the pack; but Dumont d'Urville was stopped on Weddell's meridian in 64° S., and Ross in 65° 12′ S., finding a dense impenetrable pack. My own impression is that there is a landless ocean of great extent and depth in this direction. But the data on which an opinion can be formed are meagre, and I trust that I may be wrong. It would be a misfortune if Mr. Bruce had to winter in the open pack, where little useful work can be done.

The German Expedition had the great advantage of having selected one of the two best routes for Antarctic discovery. The expedition left Kerguelan Island on January 31, 1902, but appears to have shaped a course to the south-east. I have always thought that if the *Gauss* made for Kemp and Enderby Land (which are probably one) in about 60° E., a coast-line would be found facing to the east, with navigable water, where great discoveries might be made. Even if Dr. Drygalski, after steering south-east, entered the pack away from the land, I think it likely that there is a coast-line not very far to the east. There are, in my opinion, very great possibilities in that direction, and I hope and believe that my friend Drygalski and his gallant companions will return after having made important discoveries, if not this, then next year. As a necessary precaution, I understand that, if no news is received, a relief ship will be sent out to the German Expedition next autumn. As regards magnetic observations, the *Gauss* is working in concert with the *Discovery*. Meteorological phenomena depend very much on local influences, and the separating distance precludes concert in any other form save in the form of warm and cordial wishes for the welfare of each.

The work of our own expedition, the news of which may be said to be in course of arrival, is so great a subject that it will necessitate separate treatment on another occasion. It will be remembered that the relief ship *Morning* was filled up with provisions, stores, and coals for the *Discovery*, and that a house was specially built on deck, and adapted for taking about a hundred carcases of sheep in ice. Captain Colbeck left Lyttelton on December 6 last, entered the pack on the 26th, and sighted Victoria Land on January 3. He encountered a gale of wind on the south side of the pack which lasted for six days, but he succeeded in reaching Cape Crozier on the 18th. There he picked up a record which served as his guide, and on the 23rd he found the *Discovery* in her winter quarters 500 miles further south than any one had ever wintered before. But 10 miles of fixed ice separated the two ships. Captain Scott writes in well-merited praise of the way in which the *Morning* was navigated. Mistakes might easily have been made, but Captain Colbeck made none. With skill and judgment he negotiated the ice, picked up the right clues, and, getting on the scent, he successfully reached his goal.

The relief ship proved to be a necessity. Owing to the bad tinned provisions, there had been threatenings of scurvy. The remedy was to resort to seal meat, of which there is abundance, as the only animal food to be eaten. The surgeon tells me that with this diet, and the fresh mutton brought by the *Morning*, the scurvy entirely disappeared and is not likely to return. But new and good provisions were urgently needed. Stores, provisions, and coals had to be dragged on sledges, from one ship to the other, over miles of ice. At last the hard work was finished, the *Discovery* was left well supplied for another winter, and on March 3 the *Morning* started on her return voyage. Scott and his officers had come down for a last farewell. It must have been a touching scene. The weather-beaten, frost-scarred heroes, the first great Antarctic travellers, standing on the edge of that immovable ice which imprisoned their ship, with Mount Erebus for a background. One can almost hear the cheers and see the waving caps as the *Morning* slowly moved away. Think of them now, entering cheerfully upon a second winter! Think of the terrible hardships and sufferings they have gone through for science, and for their country's credit! Is there any tale of derring-doe surpassing the story of those who have planted the cross of St. George in 82° 17′ S.?

But, as I have already said, the news is too great, far too important, to be told in a portion of an anniversary address. It is a very glorious record, and it needs suitable illustration and explanatory maps. All this I will endeavour to furnish at an evening meeting, when the grand results of their expedition must be placed in detail before the Fellows.

The *Morning* must go south again next December. The funds must be provided. But a small sum is needed, about £12,000. I will not contemplate the possibility of its being refused by the Government, for the Government is directly responsible for the safety of the seamen and marines who were invited to volunteer. Our relief ship must go on her pious errand once more, to succour, not improbably to save, our countrymen. That England could fail in such a duty is surely impossible.

THE FIRST YEAR'S WORK OF THE NATIONAL ANTARCTIC EXPEDITION.*

By Sir CLEMENTS R. MARKHAM, K.C.B., F.R.S.

We must all, I think, feel that this is a great occasion. We have received news of the splendid work done by our countrymen in the far south, and we are assembled to acquire some idea of the nature of that work, and of the general results. We shall effect this object by means of Mr. Skelton's photographs, and of the best map we have been able to construct with the materials that have reached us. We do not intend to discuss or to describe the scientific results of this work. We have not the means. All *that* is reserved for the grand day when we welcome the return of Captain Scott and his fellow-explorers to this country. To-night should rather be devoted to an endeavour to understand and to appreciate the high qualities, the indomitable energy, the strict sense of duty, the courage and hardihood which enabled our countrymen to make the extensive discoveries which are shown on the map. They represent an achievement which is quite unsurpassed in my time.

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* Read at the Royal Geographical Society, June 10, 1903. Map, p. 120. For note on map see p. 37.

Before following the memorable voyage, I must say a very few words on the subject of the arrangements for the expedition in this country. When the two Societies approached the Government with a view to obtaining assistance in June, 1899, Mr. Balfour spoke in the strongest terms of the importance of such an expedition, both from a scientific and a national point of view, and he was told that it would be necessary to build a ship specially adapted for the service, among other reasons for the sake of the magnetic observations. An estimate was submitted to him amounting to £100,000 if the expedition lasted for three years, or £90,000 if for two years. It was decided that the expedition should be for two years. Mr. Balfour promised a parliamentary grant which amounted to £45,000. The public subscribed the other moiety, this Society giving £8000. The *Discovery* was launched, and has proved most admirably adapted for the work. It has been said that she is the most expensive vessel that was ever built in this country for scientific purposes. It is equally true that she is the cheapest. For she is the only vessel that was ever built in this country for scientific purposes. She has been a great success, and she will be a great success even if she has to be abandoned in the Antarctic ice. The famous voyage performed in her, the vast and important scientific results achieved through her means, will remain for ever as the record of her success, even though the staunch old *Discovery* leaves her ribs in the far south. But this will not be if human help, guided by no ordinary ability and skill, can avail. For if the ship is strong and adapted to her work, still stronger and still better are her crew. No more striking proof of this is needed than the way they have rallied round their beloved commander. Captain Scott's deeds speak for themselves, and he was supported by such officers as Armitage, Royds, Skelton, Shackleton, and Barne; by Koettlitz, Wilson, Bernacchi, Hodgson, and Ferrar; and by twenty-six seamen and marines, all good men and true. Alas that one of the best of all, the devoted and chivalrous Shackleton, is no longer with them! The Admiralty has lent the men, without whom the work could not have been done; but we must always remember that we owe this to the good offices of our lamented associate, Admiral Sir Anthony Hoskins. We owe much more to his memory than even that.

One word with regard to the management of the business of the expedition. Since December, 1900, a Joint Finance Committee, appointed by the Councils of the two Societies, of which I have been chairman, has transacted all the business. The three other members are the treasurers of the two Societies and a distinguished official of the Treasury appointed with the approval of Mr. Balfour; these three business men have conducted the affairs of the expedition on business principles. Efficiency has been secured without waste or extravagance, and most especial care was taken with regard to the examination of the provisions by an expert under official supervision. The committee has worked and is still working harmoniously, and there has scarcely been a difference of opinion among its members. As a test of its business capacity, we have the fact that the expedition is well within the estimate, and that the committee had a balance of £7000 to meet all further expenditure, if the two ships had returned this year in accordance with the instructions. Captain Scott sat on the committee from its commencement until the departure of the *Discovery*.

Under such auspices the expedition left New Zealand on Christmas Eve, 1901, and entered the Antarctic ice. Her objects were to study the nature of Ross's great ice-barrier; if possible, to discover land to the eastward; to secure various scientific results during the voyage and in winter quarters; and from winter quarters to explore the volcanic region, and to make discoveries to the south and inland to the west. Most thoroughly and completely have the explorers carried out these instructions. Their deeds have far exceeded all that I had hoped, or even conceived possible. Let us now follow their proceedings, and endeavour to get some notion of their surroundings with the help of Mr. Skelton's photographs.

On reaching safe winter quarters, the great work of sledge-travelling was commenced with some autumn journeys. The severity of the weather was intense, both from low temperature, −42° to even −57° below zero, and from the furious gales; but the journeys were of great use, both for obtaining information respecting the lie of the land, and for the acquisition of experience. There was one fatal accident, which is admirably described by Captain Scott.

"Mr. Barne reached the crest of the hills at about noon on March 11, and camped for lunch, during which meal the wind sprang up very suddenly, bringing a heavy drift; the temperature fell, and the party, not experienced in such conditions, suffered much from frost-bites and general discomfort. In these circumstances, and imagining themselves closer to the ship than they actually were, they decided to leave the sledges and make for her. Soon after their start the gale increased, and they were enveloped in a whirl of drifting snow and entirely lost their bearings. Mr. Barne did his best to keep the party together, the more so when it became evident that the slope on which they stood was affording a less and less secure foothold. Before long, however, one of the men, Evans, slipped and disappeared from sight. After shouting and receiving no reply, Mr. Barne, cautioning the men to remain where they were, decided to follow, and very deliberately started to slide down the slope himself. He was firmly under the impression that the slope was one well known to us all close to the ship, and that after making certain he would be easily able to regain the summit and bring the men on. After waiting for some time, another of the men (Quartly) decided to follow Mr. Barne, and was immediately lost to sight. The experience of these three was identical: after the first start they were soon going at a speed which left them absolutely no control of their movements, and this continued for some 400 or 500 yards, until they were suddenly brought up in a patch of soft snow within 15 feet of a sheer drop into the sea.

"Meanwhile, of the party above, one, Hare, had decided to go back to the sledge to change his footgear, and the remaining five, after a long wait, proceeded along the slope, as they supposed, towards the ship, led by an able seaman (Wild). Luckily, Wild had nails in his boots, for, after travelling some distance, he suddenly and without warning (so thick was the snow) found himself within an ace of stepping over the cliff into the sea. He had the presence of mind to shout to the others to stop, which they were all able to do, except poor Vince, who missed his footing, shot past Wild, and was immediately lost to view. Vince was a thoroughly good man, always cheerful and bright, and popular throughout the ship. With great difficulty the remaining four men succeeded in retracing their steps, and eventually reached the crest of the hill, from whence, taking a more easterly course, they fell on some landmarks and found their way to the ship. Great credit is due to Wild for the manner in which he conducted and kept together the small party. A large search party was immediately despatched on their return to the ship, and the siren was kept going. With some difficulty the search party succeeded in finding the sledges, and in the vicinity they found Mr. Barne, Evans, and Quartly half frozen and wholly dazed; they did not know how they had again reached the summit of the hill. No trace was found of Hare or Vince. A further prolonged search was made on the following day, a roped party descending the slope with crampons, but without result. On the third day I got up steam on the bare possibility of finding an ice-foot below the ice-cliff over which Vince had fallen, and whilst we were preparing to weigh, Hare was seen descending the hill opposite the ship; he was quickly brought on board, and found to be neither frost-bitten nor in any way hurt by his exposure; he had turned to find the sledges, failed to do so, wandered aimlessly about, and finally lost consciousness; thirty-six hours later he awoke, to find himself buried in snow and only a trifle stiff; he imagined it to be the morning after the accident, and was astounded to learn that he had slept through a whole day.

"On taking the ship around to the scene of the accident, we found on ice-foot, and it was evident that Vince must have fallen directly into the sea from a cliff 150 to 200 feet in height."

When Captain Scott addressed the ship's company in a few words after service on the following Sunday, there was scarcely a dry eye. All mourned the loss of their comrade, George Vince, a cheerful and popular messmate, and an excellent seaman.

The winter passed cheerfully. There were plenty of amusements; but there was also plenty of hard work. Mr. Bernacchi tended his magnetic instruments with zealous care, and took regular observations with the electrometer. The temperature and salinity of sea-water at various depths were ascertained. Mr. Hodgson was indefatigable in all weathers, keeping holes open in the ice for his nets and fish-traps. Dr. Wilson's work, as regards vertebrates, is exceedingly valuable ; and I am assured that the biological collections are most important, and will form one of the great features of the expedition. The meteorology is under the charge of Lieut. Boyds, and nothing can exceed his care and diligence. A series of meteorological observations for two years, in 77° 50′ S., more than 500 miles further south than any ship has ever wintered before, will be most valuable.

As the sun began to return, the magnificent range of mountains to the westward began to appear in surpassing grandeur. The glow of the sun when it was still below the horizon just caught them, and the sides facing the north were lit up with a pinkish-orange tint, the other sides being dark and shadowy. In September the early spring travelling commenced, when the cold was even more intense than in the autumn. Royds and Skelton were the chief explorers of the volcanic island on which Erebus and Terror rear their giant cones. With four men, they were away twenty-one days, with the thermometer always −40°, and once as low as −58°. This cold is too intense for sledging, and in addition they encountered a furious gale, which lasted for five days. In spite of the weather, Skelton and two men found a way over the big ice-ridges of the barrier down to the sea-edge, using crampons and ice-axes, and being roped together. A close examination was thus made of the position where the barrier abuts upon the land at Cape Crozier. In a subsequent journey Royds found the post cairn at this point, and deposited a notice for the relief ship.

There were several sledging journeys for short distances conducted by the scientific staff, chiefly with the object of geological investigations; but the great results were to be obtained from the southern and western parties.

Captain Scott established a depôt 60 miles to the south in a journey of ten days, from September 23 to October 4, when there was a heavy gale, and the thermometer fell to −51°. On November 1 he started with eighteen dogs, accompanied by Lieut. Shackleton and Dr. Wilson. A supporting sledge under Lieut. Barne went as far as the first depôt. At first all went well, but after a fortnight the dogs got weaker and weaker, and a long tract of soft snow had to be crossed, which occupied them for thirty days, bringing the sledges up in relays. Practically the dogs became useless. The explorers had to do all the work themselves. But, nothing daunted, the gallant men pushed onwards, lightening the weight by leaving a depôt in 80° 30′ S.

They reached 82° 17′ S. On their return Lieut. Shackleton broke a blood-vessel, and was only just able, owing to his extraordinary pluck, to keep up with the sledge; while Scott and Wilson, suffering from snow-blindness and hunger, dragged the sledge back, 240 lbs. each, and reached the ship on February 4, after an absence of ninety-four days.

I calculate that they must have gone over 981 statute miles. The story will be told by Scott himself—a story of heroic perseverance to obtain great results; a story which is unmatched in polar annals. It will tell us, too, of new geographical facts and deductions of intense interest; of a new and hitherto unknown world in the far south, reached with such extreme difficulty—

> "Yet even here Britannia's flag has thrown
> Her shadow on the ice, and hailed the land her own."

The achievement of the great western party, dragging sledges over mountains and glaciers, with such leaders as Armitage and Shackleton, is only second to Scott's memorable journey. They were dragging 240 lbs. per man; first over 29 miles of sea-ice, and then for 19 miles up a snow-filled valley to the foot of the mountains. They also had to work by relays. Crampons, blocks and tackles, ice-axes, and crow-bars were needed; and so they climbed the ice-slopes with loaded sledges, and travelled many miles over bare blue glacier amidst magnificent scenery, reaching an elevation of 9000 feet, at a distance of 142 statute miles inland from the ship as the crow flies. They were fifty-three days away.

The loss of the dogs was felt as a great calamity, because each dog was given in charge to a man, who became much attached to it. There are, however, several puppies.

Another calamity was the loss of all the boats, which during the winter got frozen into a mass of solid ice. After hacking at this ice for months, it was found impossible to extricate the boats.

But now all the travelling parties had returned, and the longed-for relief ship *Morning* hove in sight on the 23rd of last January.

The meeting is acquainted with the history of the relief ship; how she was bought, fitted out, equipped, and despatched last year by the Geographical Society, with funds subscribed almost entirely by our Fellows. We all know the great dangers of polar navigation, and that a ship in those regions may be in need of succour after the first winter. Consequently, annual communication has been the rule with all Government expeditions since the Franklin disaster. We were bound to follow this example; and the necessity for our action has since been proved.

The *Morning*, fitted up with provisions, including a good supply of frozen meat, and coals for the *Discovery*, left Lyttelton, N.Z., on December 6, and crossed the antarctic circle on Christmas Day. She is commanded by Captain Colbeck, a very able and capable ice-navigator, who has under him zealous officers and a good crew. In about 67° 40′ S., an interesting discovery was made of a new island, of which several excellent photographs were taken. A landing was effected, and a survey was made; it was named Scott island.

Outside the pack the *Morning* encountered a heavy south-east gale, bergs and heavy floe pieces being a source of continual danger, and the ship was subjected to a most severe straining. At one time she could show no canvas. The season was very late, and the navigation difficult. But Captain Colbeck followed up his clue, found the record at Cape Crozier, and finally sighted the *Discovery's* masts.

It was found that several miles of ice intervened between the two ships, and it was not long before it became clear that the ice was not likely to move during that season. All hands at once went to work to transfer stores and provisions on sledges, and before it became necessary to depart, the *Morning* had supplied fourteen tons, and twenty tons of coal. But there was barely time.

The arrival of the *Morning* was most providential, but she leaves the *Discovery* with only provisions to last until next January, and eighty tons of coal.

In returning, the *Morning* was in some danger of being detained. She was beset, but was saved by her skilful ice-navigation, aided by a strong south-westerly gale. Her detention would have been a terrible calamity. She, however, returned safely to Lyttelton, N.Z., last March.

Captain Colbeck deserves high commendation for the skill and ability with which he conducted a very arduous and difficult voyage; for his excellent judgment in finding the winter quarters of the *Discovery*, his rapid transfer of stores, and the seamanlike qualities which enabled him to work his vessel safely out of the ice under circumstances of no ordinary difficulty. The officers worked under him with zeal and intelligence, and the conduct of the men was excellent throughout the voyage.

It will be seen that a second voyage of the *Morning* is absolutely necessary for the safety of our gallant countrymen. There are thirty-seven souls in the Antarctic ice, consisting of five naval officers, one officer of the naval reserve, five members of the scientific staff, twenty-four naval seamen and marines, and two other good men. We have a balance of £7000. Only a small additional sum is needed, namely, £12,000. Without it those heroes who have done so much for science and their country's credit will be in grave peril.

We must provide for wages for both ships; we must send out the means of blasting and forcing the *Discovery* out of her icy prison; we must repair the *Morning*, so terribly strained and knocked about; we must store her with coals and provisions.

There are difficulties and dangers yet, but the chief dangers are financial. Our gallant Colbeck and his people will overcome the rest.

Meanwhile, the heroic Discoveries, are still working for us at their numerous observations under increasing hardships caused by the small stock of coal. They have full faith in us, and that the needful funds will be found by us. Look once more at your maps. Look at their discoveries. Do not these men deserve well of their country? Will not their country recognize their services? I feel sure that it will, and that we shall yet welcome them all here, after one of the most successful and glorious achievements that have ever adorned our geographical annals.

NATIONAL ANTARCTIC EXPEDITION: REPORT OF THE COMMANDER.*

UNDER the title of "Brief Summary of Proceedings," Captain Scott sends the following report addressed to the Presidents of the Royal and Royal Geographical Societies. It is dated "*Discovery*, Winter Quarters, February 23, 1903."

As is known, the *Discovery* left Port Chalmers, New Zealand, on Christmas Eve, 1901, heavily laden.

With a fair wind, we made good progress under sail alone until our arrival in the pack.

On the evening of January 1 we passed several table-topped bergs, and on the following day, in lat. 66° 30′, fell in with streams of loose field-ice.

The antarctic circle was crossed early on the 4th, the pack remaining easy and the weather favourable, except for occasional thick fogs.

On the 6th the pack became much heavier and our progress consequently slower; later all traces of a swell disappeared, and we forced our way through rotten floes of very large area.

We passed through several leads of open water on the 7th, and on the morning of the 8th crossed the southern edge of the pack in lat. 70° 25′, long. 173° 44′, the edge being well defined, with a clear open sea beyond, and soundings in 1480 fathoms.

Opportunities were taken before and after this to sound, dredge, and take water samples, but owing to closeness to the coast and the thick pack which was usually about us, much less of this work was possible than I could have wished.

We arrived at Cape Adare on the evening of the 9th, having to force our way through a line of thick pack in entering Robertson bay; after taking magnetic observations, watering ship, and leaving a record, we weighed anchor again at 3 a.m. on the 10th, passing out close under the land, where we became involved in a very heavy pack running fast to the northward past several grounded bergs. After several hours of struggling, I was glad to get through this into clearer water.

We turned down the coast, passing outside the Possession islands, but had now to face an increasing south-easterly wind and continual streams of pack passing to the northward.

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* Map, p. 120.

We arrived off Coulman island on the night of the 12th, but as the wind had increased to half a gale and the glass was falling, I decided to make for shelter under the island; we arrived there on the evening of the 13th, and on the following morning the wind had increased to a full gale. Except as regards the sea and pack, the island afforded little shelter; the wind swept down from the heights with terrific force, and the ship was repeatedly driven to leeward, narrowly escaping collision with several small bergs.

On the 15th the wind fell rapidly, and in the afternoon I was able to place a record at Cape Wadworth, in the spot arranged.

In the evening, in bright calm weather, we were able to stand into an inlet in the ice-barrier in Lady Newnes bay, and all hands were employed in killing and skinning seals for winter consumption; we left this inlet at 8 a.m. on the following day, but had to pass again to the northward of Coulman island to avoid the pack.

We had now to make a very long circuit to clear heavy pack, and arrived off Wood bay on the night of the 17th.

The bay ice was cracked, but had not moved out; it was very thick and heavy, and consequently I abandoned the idea of leaving a record at this spot.

At noon on the 18th we passed close to Cape Washington in clear water, obtaining as shallow a sounding as 8 fathoms. From this cape the absence of pack allowed us to trace the coast-line at a very easy distance, and to observe and sketch the mountains in the background. In about lat. 75° 30' an enormous floe of the inland ice descends into the sea and extends for many miles to seaward. The ice-mass, which must be afloat at its outer edge, closely resembles the Great Barrier and the barrier formation which entirely fills Lady Newnes bay.

On the night of the 18th we entered a curious inlet at its northern junction with the land. From this point we were obliged to pass direct to the eastward, skirting ice-cliffs rising to 150 feet in height.

At noon on the 19th we rounded the end of this ice-mass, but were unable to again approach the land immediately, though at 6 p.m. we again turned in that direction.

A bluff headland now observed to the south-west gave indication of a harbour, and our course was shaped for it, but this necessitated passing through streams of very heavy hard ice, and our progress was therefore slow, and it was not until 6 p.m. on the 20th that we entered a long inlet which gave promise of forming an excellent winter harbour.

A landing was effected, and some hours spent in exploring the inlet and securing specimens of rock, moss, etc. Leaving the harbour shortly after midnight, we continued for some distance in clear water, but later encountered streams of loose ice, and by the forenoon were in thick pack with an uninterrupted stretch of ice before us. We made such poor progress that at 8 p.m. (21st) I decided to turn to the eastward, more especially as I then fully thought I could trace continuous land between Mount Erebus and the mainland.

The weather since our departure from Coulman island had remained wonderfully clear and bright.

Passing south of Beaufort island, we arrived off Cape Crozier on the evening of the 22nd, and landed at the foot of Mount Terror, visiting the penguin rookery, placing our record and taking magnetic observa tions. Climbing a foothill to the height of 1350 feet, we here got our first view of the barrier. The shore party were re-embarked at 4.30, and we stood close around Cape Crozier.

Until the 28th we continued to push close along the barrier edge in face of a steady south-easterly breeze and westerly set.

On the 26th the wind increased to half a gale, and we stood off under sail; but the wind again fell in the morning, and we were able to close the ice. During this time soundings were taken three times daily, and the height and irregularities of the barrier edge observed as closely as possible.

It is impossible to give details of this work until we have had time to plot it; but in general it may be remarked that the soundings remained fairly uniform at something over 300 fathoms until the night of the 29th, when 100 fathoms was obtained; and the barrier edge is most irregular, varying from 30 feet to 215 feet, though long stretches of it appear to be of uniform height. On the 29th the barrier was observed to be very irregular in outline, and in the evening we ran into a sharp bend amongst many stranded and overturned bergs. Here we first obtained shallow soundings (100 fathoms), and observed that the barrier rose to the eastward in gradual snow-slopes to a height of 800 or 900 feet, continuing to form a number of undulating hills, trending to the northward. From this time the fine clear weather we had had so far enjoyed deserted us, and a northerly breeze brought continual snowstorms, which prevented our seeing clearly for any considerable distance. On the morning of the 30th we were skirting the edge of low fast ice embayed between ice islands; much pack lay in the offing. The soundings varied greatly, but several were between 70 and 100 fathoms. At four, a lift in the fog showed us high rising snow-slopes in the background, descending gradually towards the sea until they fell away into heavy ridges and precipices 300 or 400 feet in height, from the base of which a gentle slope led to a barrier wall, capable of sending forth table-topped bergs. Though morally certain we were in the vicinity of land, the appearance of ice-formation is so deceptive in thick weather that I was glad when several dark patches loomed out of the mist and were quickly distinguished as patches of bare rock. These patches stand at a height of 2000 to 3000 feet, and are evidently the sharp spurs of hills which are otherwise completely snow-capped.

During the morning of the 31st we skirted along the edge of solid fast ice, and later were amongst several ice-islands; these are mostly dome-shaped on top, descending to ice-cliffs 50 to 60 feet in height; the soundings close to being about 100 fathoms, it is impossible to know whether these are ice-capped islands, ancient grounded bergs, or the remains of a receding barrier formation. They undoubtedly prevent the fast ice from breaking away to the coast-line.

Very large colonies of Emperor penguins were seen in this vicinity.

During the night of the 31st we became embayed amongst ice-islands and grounded bergs, almost completely connected by fast ice; in the bay the temperature fell, and young ice formed with extraordinary rapidity. After looking fruitlessly for an outlet, we were forced to come out through the narrow passage at which we had entered. I then made a *détour* to the westward in hopes of finding an open lead, but as we increased our distance from the land we were faced in all directions by heavy pack.

At this point, seeing the inadvisability of wintering in these regions, and not knowing how late a date it would be possible to find winter quarters in Victoria Land, I determined to turn back, though it is now evident we could have pursued our exploration to a later date.

On February 3 we entered an inlet in the barrier in lat. 78° 30′, long. 196° 15′. It was wholly sheltered, and we were able to lay alongside an ice-foot on to which we could step from the ship's rail. The barrier here undulated in long waves running approximately west-south-west and east-north-east; the ship lay in an inlet formed in the hollow of one of these undulations, and a long crack continued the inlet to the westward. Numerous seals lay about on the ice in the vicinity of this crack. This night I despatched Lieut. Armitage with a small sledge party to explore the ridges, and prepared to inflate our balloon. On the 4th the balloon was inflated, and I was able to ascend to a height of 700 feet, the wire attachment being unfortunately too heavy to allow of a higher ascent. The day was clear; the alternate light and shade of many parallel lines of undulation could be seen to the southward, and nothing beyond. Shortly after noon Lieut. Armitage returned, having travelled about 9 miles to the south and traversed several of these undulations. After securing the carcases of eighteen seals killed in the morning, we put to sea again at 7.30. A sounding taken in the inlet showed 315 fathoms, and it was noticeable that the ship neither rose nor fell in relation to the ice throughout our stay.

We returned along the barrier and rounded Cape Bird on the evening of the 7th in heavy and continuous snowstorms. I now made for some steep headlands in about lat. 77° 30′, which we had observed on our way south, and hoped to find the limits of a harbour similar to that which we had entered to the northward.

The day was fine (8th), but when within 10 miles of the land we were brought up by a heavy pack, and decided to skirt this, making as much southing as possible. In the afternoon we passed close to an extraordinary *débris*-strewn and water-worn glacier snout, on which we landed. Proceeding as before, we now found ourselves going about due east and towards the southern side of Mounts Erebus and Terror. Finally, in the evening we arrived at Hut point, securing the ship to the ice-foot.

I give elsewhere a description of our winter quarters, with the present position of the ship, and a rough plan of the neighbourhood.

Everything pointed to the desirability of this spot as winter quarters. The one year's ice was moving out rapidly, and showed absolutely no signs of pressure. Hut point would provide an additional safeguard against such a possibility; suitable places were easily found for the huts, to communicate with the agreed position, for our record position at Mount Terror seemed (and proved) easy; the road to the southward appeared open, and the distance from the mainland was small enough to ensure an attempt at its exploration.

No thought that the ice might not again move out this season entered any one's head, and, of course, was the less likely to do so as the open sea extended farther and farther beyond Cape Armitage. Personally, my fear was that some sledge party might be cut off by the ice moving out too quickly, and without warning, as it did last year.

On February 11 we commenced erecting the huts, but the task was much interrupted by strong south-easterly winds; whilst the amount of work on ship and shore prevented all ideas of despatching early sledge parties.

On the 18th, three of the officers—Messrs. Shackleton, Wilson, and Farrar—crossed to the island, which lies about 15 miles south-south-east of the ship; they returned on the 22nd, with considerable information as to the lie of the land.

On the 24th we were able to land coal, oil, and provisions, and thus established a depôt in the event of the ship being driven off. The magnetic huts were erected, and the instruments in adjustment, in time for the term day observations of March 1.

The work was now so far advanced that I proposed to take a sledge party round to Mount Terror, but, unfortunately, strained my leg whilst exercising on ski, and was forced myself to abandon the project.

On Monday, March 3, the party started under the direction of Mr Royds, and included Mr. Barne, Dr. Koettlitz, Mr. Skelton, and eight men. As they entered the eastern bay, the snow grew daily softer, and the work finally so fatiguing, that Mr. Royds decided to push on with Dr. Koettlitz and Mr. Skelton on ski, sending the remainder of the party back under Mr. Barne, they having no ski.

By this time the ice had broken away well past Cape Armitage, and it was necessary for the returning parties to cross the hills, rising to an altitude of 1000 feet, to reach the ship.

Mr. Barne reached the crest of the hills at about noon on March 11, and camped for lunch, during which meal the wind sprang up very suddenly, bringing a heavy drift; the temperature fell, and the party, not experienced in such conditions, suffered much from frost-bites and general discomfort. In these circumstances, and imagining themselves closer to the ship than they actually were, they decided to leave the sledges and make for her. Soon after their start the gale increased, and they were enveloped in a whirl of drifting snow and entirely lost their bearings. Mr. Barne did his best to keep the party together, the more so when it became evident that the slope on which they stood was affording a less and less secure foothold. Before long, however, one of the men, Evans, slipped and disappeared from sight. After shouting and receiving no reply, Mr. Barne, cautioning the men to remain where they were, decided to follow, and very deliberately started to slide down the slope himself. He was firmly under the impression that the slope was one well known to us all close to the ship, and that after making certain he would be easily able to regain the summit and bring the men on. After waiting for some time, another of the men (Quartly) decided to follow Mr. Barne, and was immediately lost to sight. The experience of these three was identical: after the first start they were soon going at a speed which left them absolutely no control of their movements, and this continued for some 400 or 500 yards, until they were suddenly brought up in a patch of soft snow within 15 feet of a sheer drop into the sea.

Meanwhile, of the party above, one, Hare, had decided to go back to the sledges to change his footgear, and the remaining five, after a long wait, proceeded along the slope, as they supposed, towards the ship, led by an able seaman (Wild). Luckily, Wild had nails in his boots, for, after travelling some distance, he suddenly and without warning (so thick was the snow) found himself within an ace of stepping over the cliff into the sea. He had the presence of mind to shout to the others to stop, which they were all able to do, except poor Vince, who missed his footing, shot past Wild, and was immediately lost to view. Vince was a thoroughly good man, always cheerful and bright, and popular throughout the ship. With great difficulty the remaining four men succeeded in retracing their steps, and eventually reached the crest of the hill, from whence, taking a more easterly course, they fell on some landmarks and found their way to the ship. Great credit is due to Wild for the manner in which he conducted and kept together the small party. A large search party was immediately despatched on their return to the ship, and the siren was kept going. With some difficulty the search party succeeded in finding the sledges, and in the vicinity they found Mr. Barne, Evans, and Quartly half frozen and wholly dazed; they did not know how they had again reached the summit of the hill. No trace was found of Hare or Vince. A further prolonged search was made on the following day, a roped party descending the slope with crampons, but without result. On the third day I got up steam on the bare possibility of finding an ice-foot below the ice-cliff over which Vince had fallen, and whilst we were preparing to weigh, Hare was seen descending the hill opposite the ship; he was quickly brought on board, and found to be neither frost-bitten nor in any way hurt by his exposure; he had turned to find the sledges, failed to do so, wandered aimlessly about, and finally lost consciousness; thirty-six hours later he awoke, to find himself buried in snow and only a trifle stiff; he imagined it to be the morning after the accident, and was astounded to learn that he had slept through a whole day.

On taking the ship around to the scene of the accident, we found no ice-foot, and it was evident that Vince must have fallen directly into the sea from a cliff 150 to 200 feet in height.

Though Mr. Barne made an error in breaking camp in a snowstorm, it must be remembered in extenuation that he, in common with all, was inexperienced in the climatic conditions of these regions; that he imagined himself much closer to the ship than he was; and that his party, expecting higher temperatures, were very ill provided with fur clothing, and would have been most uncomfortable in their tents. The event proved a lesson to all, and Mr. Barne has in his more recent expedition taken exceptional and most praiseworthy care of his men.

On March 20 Mr. Royds and the remaining officers returned to the ship; they had failed to reach the spot for depositing the record, but chiefly because they had encountered very severe weather in the vicinity, and their provisions were too short to allow of delay. They were evidently very close to the spot, and no doubt remained that we should be able to reach it in the spring.

During the month of March ice repeatedly formed about the ship, but was constantly blown out; that which formed immediately around her on March 24 has remained, though for some time, I think, only because the ship held it in.

On April 1 Mr. Armitage and I started with a party of twelve men and the dogs to lay out a depôt to the south-east. After crossing the new ice and rising to the barrier surface, the temperatures fell rapidly until the average was below −40°: the dogs' coats were in very poor condition, and we could get no work out of them; the fur clothing proved to be unsuitable, and the men, wholly unaccustomed to the conditions, suffered severely. After three days, therefore, the temperature having fallen to −48°, I decided to turn back, and returned to the ship.

From this time preparations for the winter were pushed on, the winter awning was spread, and the ship made as snug as possible.

The winter passed very comfortably. The men remained cheerful throughout, plenty of work was found for them out-of-doors, and a regular routine was maintained; the only drawback was the prevalence of a keen but apparently purely local south-east wind, which often made our exercise unpleasant and not infrequently impossible. It was not until May 3 that a strong southerly gale brought the first heavy snowfall, allowing the decks and sides of the ship to be partially covered with snow; this greatly improved our comfort below. The same gale blew the strait clear of ice to within 200 yards of the ship.

I fear I have not the time to relate all the incidents of the winter, but I would mention that officers and men did their best to continue all the scientific observations possible under the conditions. Mr. Hodgson was always out and about, keeping holes open in the ice for his nets and fish-traps, and, whatever the temperature, volunteers were always ready to assist him at the work.

All the officers joined in taking the night meteorological observations, though Mr. Royds alone took those between 10 a.m. and 10 p.m.

Mr. Bernacchi tended his magnetic instruments with zealous care, and took regular observations with the electrometer. Ice-measurements were taken as often as possible, and tidal observations regularly. Experiments were carried out to determine the temperature and salinity of the ice at various depths. Auroral displays were infrequent and feeble, but were carefully observed when they occurred.

We experienced our lowest temperatures in the spring, when also the wind became even more persistent and annoying. Every indication pointed to the temperatures to the south and on the Barrier being far lower than those which obtained about the sheltered position of the ship.

On September 2, I started with five officers and fifteen dogs to the northward to explore the bay towards Cape Bird and examine the islets and glacier in it. This short journey convinced me that it was possible to start the prearranged reconnaissance trips. I returned on the 5th, and on the 10th Mr. Royds, with Dr. Koettlitz and five men, proceeded to the south-west with a fortnight's provisions in an attempt to reach the mainland.

On the 11th, Mr. Armitage, with Mr. Ferrar and five men, started to the westward with the same intention. Approximately south-south-east of us lies a white snow-covered island, and south-south-west a black wind-swept one; a bold headland connected with the mainland can be seen beyond through the gap almost due south of the ship. My own intention was to lay out a depôt in this direction.

Mr. Royds returned to the ship on the 19th, having experienced very low temperatures and much wind; from his report I learned that no clear water to the mainland was likely to be found in a south-western direction.

I started with my party on the 17th, but at the first camp, about 12 miles from the ship, encountered a heavy gale, which blew throughout the 18th with a temperature below −40° (min. −51°); as our sleeping-bags were filled with ice, and one of the party badly frost-bitten, I returned on the 19th, and again started on the 23rd with Mr. Shackleton, the boatswain, and the dogs.

We reached the north side of the cape in three days, but found our further progress barred by heavy ice-upheavals, cracks, and crevasses, evidently the result of the barrier ice pressing up from the southward around the cape. Turning to the eastward, we had, in a bad light, to cross very disturbed ice with deep, lightly bridged crevasses; into one of these the boatswain fell, and was only saved by his harness, which luckily held, though stranded. We arrived on the southern side of the cape on the 30th, and, selecting suitable leading marks, deposited the depôt about 8 miles from the land and 60 miles south of the ship.

From this point land could be seen to the south-south-west, continuing the outline of Victoria Land, but from this direction through south to the slopes of Mount Terror, bearing slightly to the eastward of north, an unbroken horizontal line indicated the continuance of the barrier surface. Returning outside the snow-covered island, and therefore skirting the disturbed ice, we regained the ship in 2½ days. On my return I learned that Mr. Armitage, after an arduous journey, had arrived back on the 25th with his party in a more or less broken-down condition.

The cause was undoubtedly scurvy, and, as undoubtedly, the disease was brought out by the severe work and exposure to which they had been subjected.

The most severe cases were Mr. Ferrar, Cross, P.O., and Heald, A.B.

A thorough examination of the ship's company showed that there was a taint of the disease in both officers and men.

The following steps were taken: all tinned meats were discontinued, and only seal meat served out.

An extra allowance of bottled fruit was issued, and lime-juice provided.

The holds and storerooms were again thoroughly overhauled and disinfected.

Under these conditions, to which must be added the gradual improvement in the weather, and the inspiriting effect of the lengthening days, all symptoms quickly disappeared. Mr. Ferrar, Cross, and Heald rapidly recovered.

I realize that this outbreak of scurvy, such as it has been, is more than likely to be exaggerated by irresponsible persons, especially in view of the tales that may be told by or attributed to the men now being discharged from the ship. Whilst appreciating the gravity of the disease in this climate, I beg to assure you that the outbreak was in reality slight, as indicated by the rapidity with which it was thrown off. I doubt if its existence would have been discovered but for the severe work which brought it to light in Mr. Armitage's party.

In consultation with the doctors, I can arrive at no satisfactory explanation of the cause of the outbreak. The tinned meats used in the winter are of excellent quality, and every tin was examined by the doctor before use. For the greater part of the winter seal meat was issued three times, and fresh mutton once a week.

A possible cause may lie in the following facts:—

(1) For a month before the commencement of sledging the supply of seal meat ran short; very few seals came up on the ice, and the full ration could not be issued.

(2) The cook, though quite capable of cooking well, served up the dinners, and especially the seal meat, in a most unappetizing manner.

I fear it is not in my ability to throw more light on what has happened, but I beg to call your attention to the certainty of recovery which results from a liberal supply of seal meat.

This was the more evident in connection with the extended summer sledge journeys: the disease again manifested itself in a slight degree, but was immediately dispelled on the return of the men to the ship.

There is absolutely no cause for anxiety should we be forced to spend another winter here. The men remaining are now in the most splendid health and condition, and we shall have no difficulty in laying in an ample supply of seal meat. We have already shot a large number of Shua gulls, which we find excellent eating.

Mr. Armitage, in his reconnaissance, succeeded in reaching the surface of a glacier on the mainland, and continued to ascend it to a height of several hundred feet; he reported a good prospect of being able to continue on it to the inland ice.

On October 4 Mr. Royds, Mr. Skelton, and four men left the ship for Mount Terror, to renew the record previously left at the Penguin Rookery.

The eastern slopes of Mount Terror are terribly wind-swept, and their surface is bare to the summit. On arrival at their foot the party encountered a heavy gale, which blew continuously for five days, for the greater part of which they were confined to their tents, round which the snow steadily accumulated, narrowing their space. Cooking was rarely possible.

Mr. Royds suffered severely from cramp, and in consequence when this gale ceased Mr. Skelton started with two men to find the record. This was successfully accomplished, and on the following day the same small party, roped together, wearing crampons and carrying ice-axes, succeeded in descending to the sea ice, where Mr. Skelton had previously observed a large number of Emperor penguins. As a result of his enterprise he was able to get several specimens of young Emperor penguins in down, and an excellent series of photographs and notes.

Mr. Skelton deserves great credit for this discovery, the descent on to the sea ice being a very hazardous proceeding over the very disturbed ice at the place at which he made it.

Mr. Royds returned to the ship on the 24th. During the first part of the journey he had experienced very low temperatures, one of which, −57°, is the lowest recorded on any of our journeys.

By this time preparations for the southern trip were almost completed.

On October 30 Mr. Barne started with eleven men as a supporting party, with instructions to make for the depôt (A) which I had already established off the Southern cape.

On November 2 I left the ship myself with Dr. Wilson and Mr. Shackleton and nineteen dogs. The dogs were in splendid condition, and, though loaded with 100 lbs. apiece, were so fresh that we were obliged to sit on the sledges to restrain them. We caught up Mr. Barne that night as he was starting on a night march, having been detained by bad weather. The weather continued very unsettled, and we did not reach the depôt till the 10th, and the supporting party joined us there on the following day, and we started due south in company on the 12th. The dogs were in such excellent condition that they far out-distanced the men, and we gradually increased their loads until on the third day they were dragging the whole of our own loads, and the supporting party, which I had intended carrying some way further, were no longer of use. On November 15, therefore, in lat. 79° 15′, I directed them to return to the ship, and we continued our journey alone.

At this time we had high hopes of being able to explore to a considerable distance over the barrier, but within a very short time the aspect was completely changed. Almost at once the dogs began to show signs of weakening, and at first it was very difficult to discover the cause; rest and increase of food made no improvement. We eventually discovered that it was the nature and not the amount of food that was at fault. Norwegian stock fish was the food selected and strongly recommended from its use in Greenland, where a team of twenty-three dogs had been worked on it for three years without the loss of a single animal. This being so, one can only conjecture that the fish deteriorated on its passage through the tropics: certainly its effect on our dogs was most disastrous. We continued to the southward, but were forced to do so by advancing half our load at a time; the surface became more difficult, and dogs failed so speedily that we were obliged to pull ourselves to get even the half-load along.

As we proceeded, we could distinguish new but distant land on our right, continuing that which we had observed from depôt (A) to the west-south-west, and it soon became evident that this land extended to the south approximately parallel to our course.

We crossed the 80th parallel on November 27, when our progress became so laborious that we could hope to do little without establishing a further depôt, and the course was altered to south-west and later to west-south-west.

It was not until December 15 (after twenty-nine days of relay work) that we arrived sufficiently close to the land to obtain good leading marks for our depôt. As we could not rely on the dogs for our return, I left here (depôt B) three weeks' provisions, and proceeded to the south with the four weeks' which we had remaining. We lightened our load in every way possible, carrying no dog food, and calculating our own food for something less than 2 lbs. per day per man.

Depôt B was approximately in lat. 80° 30′, long. 162° E., about 7 miles from a snow-covered headland, which formed the northern extreme of a mass of land with high and irregular ranges of mountains in the background. To the north of this headland, between it and another mass of high land, the barrier ran back through an apparent strait, behind which nothing could be seen, though it is evident, from the disturbed state of the surface, that ice is pressing out through the strait.

Another such strait exists at the farthest point we reached, and another to the northward.

We continued south along the coast-line until December 30, the surface often soft and sticky, and close to the land invariably so, the dogs growing daily more feeble and sickly.

We had now arrived in lat. 82° 17′, long. 163° E., and were close to a cape which bounded the northern side of another apparent strait running in a north-west direction. To the west-south-west there was a range of magnificent mountains, and another range of great altitude lay to the south, close to the coast-line, which continued as far as could be seen in a direction south by east of our position.

I fear it is impossible without a chart, and in the time at my disposal, to inform you of the many points of interest of this journey.

I took as careful observations as I could for our positions, and of the bearings of the various land masses, the altitudes of the mountains, etc., but it will take a considerable time to work out and plot these observations. Dr. Wilson has a most excellent series of sketches of the coast from many points of view, and Mr. Shackleton has some photographs of interest.

On December 31, we made an attempt to reach the land to secure rock specimens, though undoubtedly the rock is of the same volcanic nature as that to the northward. After proceeding about 4 miles on ski, we were confronted by an immense chasm, a mile in width, and about another mile from the cliffs. The chasm was filled with huge irregular blocks of ice. With the aid of a rope and with much exertion we commenced to climb across and around these blocks. As we proceeded they became sharper and "newer" in outline, and much less snow lay about them. When within a few hundred yards of the other side, we found that the inner boundary of the chasm consisted of a huge perpendicular ice-foot trench, resembling that we had seen both east and west bounding the lands and washed by the sea. A gentle snow-slope descended from the foot of the cliffs to the ice-foot, and the blocks of ice that lay in the chasm had evidently calved from it. As it was obviously impossible to climb this ice-wall, we were forced to return to camp.

On January 1 we started back for depôt B. The dogs were now utterly spent and practically useless from this point; on the 9th, we unharnessed them, and, hoping to keep some alive, carried their food on our sledges. The weather now became very thick, and the land was obscured; the surface seemed to grow more difficult, and we had most serious trouble in steering a course, our fickle guides being the sun, wind, and astrugi, or the tail end of a cloud: during these days, most of these, and sometimes all, failed us. On the 13th, we were forced to camp for this reason; we had only two days' provisions left, but though we had been travelling for some time almost by dead reckoning, I knew we must be in the vicinity of the depôt. I was therefore much relieved when at noon a slight clearance of the mist showed us the depôt flag about 2 miles to the northward,

On returning to this depôt, I hoped to be able to make another attempt to reach the land, and to carefully pilot the coast-line to the northward; the former was rendered impossible, and the latter difficult, by the sudden breakdown of one of my companions, Mr. Shackleton. Before reaching depôt B, it seemed to me he was feeling the strain of our recent work much more than Dr. Wilson or I were; he suffered considerably from shortness of breath.

When we left depôt B on January 14, the congestion had greatly increased: he was breathing asthmatically and spitting up a considerable amount of blood. Recognizing the gravity of the case, Dr. Wilson and I decided we must push on at all costs, and keep Mr. Shackleton walking on ski beside the sledges. This necessitated Dr. Wilson and I dragging 260 lbs. apiece, and I do not think we could have carried Mr. Shackleton as well. By this time our dog team had dwindled to two—the other poor animals, growing too weak to even walk alongside the sledges, had been dispatched; for the two (our best) we were carrying food, hoping to save them, but at this crisis I abandoned this idea, and they were killed. Relieved of all camp work and pulling, Mr. Shackleton made some progress towards recovery, and was able to keep up well until we reached depôt A on January 28, when he was again thrown back by a snowstorm, and caused us the gravest anxiety. On the 30th we were able to push on once more, and arrived back at the ship on February 3. Mr. Shackleton has since practically recovered, but both the doctors agree that he ought not to risk further exposure, and, much as I regret parting with him, I do not think the health of an executive officer of this ship should be open to any doubt. I am, therefore, sending him home by the *Morning*.

On my return to the ship, I learnt that the programme for other sledge parties, which had been arranged before I started, had been carried out with some success and without accident. Mr. Royds journeyed again to Cape Crozier on November 3, accompanied by two men, to revisit the Emperor penguin rookery and make further observations. These objects he satisfactorily accomplished, and though the Emperor penguins had left, he obtained more specimens of the young, and had the good fortune to find an egg. The Ross sea, which had been cleared by the gale on his previous visit, was again frozen over when he arrived. The party again experienced very bad weather on the Terror slopes, being tent-bound on the 7th and 8th, and again on the 11th and 12th. The Adelie penguins had returned to their rookery and started to lay eggs, a number of which were brought back to the ship; the party returned in good health and condition on the 17th.

Mr. Armitage started on his main western trip on November 29. He was accompanied by Mr. Skelton and ten men, with a supporting party, consisting of Dr. Koettlitz, Mr. Ferrar, and seven men. They proceeded towards the glacier previously ascended, reaching a line of "sokers" which fringe its edge, extending for about 10 miles north and south, at 29 miles from the ship, on December 2.

The glacier descends between precipitous granite mountains. On December 6 they reached a point at which it turned abruptly to the south, running behind the high range of mountains visible from the ship. They had now travelled 15 miles over the surface of the glacier, and ascended 3400 feet. Skirting the ice-clad foothills of the above range, they arrived at the summit of a pass, from which to the westward a steep descent led to another glacier, which discharged its ice, after many windings, farther to the northward.

They were now 53 miles from the ship and 4000 feet above sea-level. On the 9th Dr. Koettlitz and his party returned, and Mr. Armitage, thinking the descent to the westward too steep, ascended a steep slope with the aid of tackles, intending to attempt crossing the mountains. With this idea they ascended another 1700 feet; but they realized the task to be impossible in the time at their disposal, and, returning once more to the pass, decided to attempt the descent to the glacier below. With some difficulty, and considerable risk to the sledges, this was accomplished, and they arrived on the glacier at a point 1900 feet below the pass.

They proceeded to ascend the glacier in a northerly direction towards a range of remarkably bare granite mountains, running north-west and south-east. At the foot of these the glacier formed the junction of two tributary glaciers; choosing the right-hand one, the party proceeded in a north-westerly direction, having to cross heavily crevassed ice where the inclination grew steeper.

Mr. Armitage reports—

"The surface of the glacier was, generally, much cut up; in parts like a ploughed field, in others like a cracked glass dome, through the cracks of which no bottom could be seen. On the way up the glacier we planted a line of sticks. During a period of twenty-three days the greatest movement shown was 3 feet 8 inches."

This slow glacial movement is in keeping with other observations made in this vicinity.

Mr. Armitage continues—

"On January 2, at an altitude of 8000 feet, some of my men (six) had to be left behind, the rarefied atmosphere and exertion proving too much for them."

Mr. Armitage, with Mr. Skelton and four men, still continued to ascend, until, having gained another 1000 feet in height, they found before them a smooth, open, snow-covered plain, over which they travelled for a short way. The farthest point reached was in lat. 77° 21′ S., long. 157° 26′ E. Observations showed a magnetic dip of 84° 24′.

The snow surface was soft, with successive crusts 9 inches or 1 foot apart; there were no sastrugi.

Mr. Armitage thought he detected a slight descent in the plain to the westward, but of this he could not be certain. The whole horizon to the westward was unbroken and clear.

On January 6 the party started to return, reuniting with the detached party on the same night. One of them, McFarlane, had to be carried on the sledge for most of the way back.

On their return Mr. Armitage remarks, "We found running 'becks' of water on the east side of the glacial valley, 7 feet wide and 9 inches deep. At level places large pools were formed, sometimes 1 mile in diameter. Bergschrunds, 150 feet deep, were found at the base of the mountains; huge 'erratics' were visible on the surface of the glacier (one measured 30 feet by 19 feet by 12 feet)." To ascend to the summit of the pass, they had again to use tackles for the sledges. On the 17th they arrived abreast of the Eskers, and on the 19th reached the ship.

This journey was, I think, a very fine one, and reflects great credit on Mr. Armitage. The sledges had often to be dragged up steep places one at a time, and, consequently, the distance traversed many times. Many dangerous crevasses had to be crossed. Mr. Armitage himself fell into one of these, and was only saved by his harness, after he had fallen some 15 feet; he received a severe shaking in consequence.

As I have not had time to inquire closely into Mr. Barne's or Dr. Koettlitz's journeys, I have asked these officers to draw out a short summary of their work, which I attach hereto.

It will, of course, be extremely difficult to follow the course and proceedings of the various sledge-parties without a proper chart, but this will take some time to construct. I am glad to be able to report that there is a considerable amount of data for its construction.

R. F. SCOTT, *Captain.*

Discovery, Winter Quarters, February 26, 1903.

SUMMARY OF SOUTH-WEST SLEDGE TRIP, DECEMBER 20, 1902, TO JANUARY 30, 1903.

Left *Discovery* December 20, 1902, with four seamen and one stoker, two tents, two sledges, and five weeks' provisions (one week at depôt A), and one week's bag for southern party; total weight, 1148 lbs.

Arrived at depôt A, December 31, 1902; left depôt A, January 1, 1903.

Travelling towards southern visible land, and altering course to south to clear each successive rise of land as it appeared above the horizon. Passed two gaps, or straits, in the coast, beyond which (to westward) was an apparently flat horizon, land extending to southward.

On January 14, having been out fourteen days from depôt A, we turned back, the weather having been very thick for the last two days, and being very thick at the time, having got abreast of the southern of the two gaps we saw.

Weather remained thick, with the exception of two days, when a short view of bits of the land was obtained, till the 24th, when it cleared, and on the evening of which day we reached depôt A.

Reached the ship on January 30.

On the way out, on December 28, we crossed the fresh track of a single Adelie penguin, travelling east, having apparently come from between Mount Discovery and Black island; * and on the way home we crossed the track of another one, a few miles further north, and going in about the same direction.

Got rounds of angles and bearings nearly every day till January 15, when we had started back. After that date the weather was thick till the 26th, 28th, and 29th, on which dates I got rounds of angles.

The health of the party was good. Every one wore goggles all the time, and I did not have occasion for any medical treatment.

MICHAEL BARNE, *Lieut. R.N.*

SLEDGE JOURNEYS—REGINALD KOETTLITZ.

1. *For the purpose of investigating the rough old ice and esker-like lines of rock débris which pass to north from "Black" and "Brown islands."*

September 24, 1902.—Mr. Bernacchi, Mr. Daily, and I left on this date, course direct for middle of "Brown island;" reached "old ice" at noon, and outskirts of rough "old ice" by 2.30 p.m.; arrived at esker-like lines following day: 17 geographical miles—some of heaps of *débris* 160 feet high (by aneroid); ice so rough we were obliged to go south to "Black island," which was reached on 27th. Ascended north-west promontory of island on 29th; found a channel apparently existed between "Brown island" and Mount Discovery, which is choked up with lines of rocky *débris* and broken ice, also that a channel separates these from "Black island." Saw that a glacier of some size comes down from the mountains behind Mount Discovery, and it appears to be the source from which the eskers are derived. "Brown island" seemed inaccessible to a sledge party, owing to this side being surrounded by lines of rocky *débris* 3 to 5 miles from its base. Returned to ship down newly found channel on west side of "Black island"—which ends in the barrier to the southward, with several tide cracks running, at its apparent junction, from "Black island" towards the Bluff range—round south side of "Black island;" and reached ship on October 2.

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* *White island* is that described in my journey as lying to the south-east.

Black island is the wind-swept one to the south-west.

Brown island is another of browner basaltic rock situated at about the same distance south-west by west.

Mount Discovery is a very conspicuous isolated conical mountain, nearly 10,000 feet in height, and presenting the same aspect in all directions. It is viewed from the ship between Black and Brown islands, at a distance of 34 miles.

The Bluff is the temporary name given to the conspicuous cape to the south which limited our view of Victoria Land before the sledging commenced.

R. F. SCOTT.

2. *Short sledge trip to Erebus bay, to ascertain whether an Emperor penguin rookery existed anywhere there or not.*

November 3.—Mr. Skelton, Hare, and I left the ship on this date, reached glacier snout by 2 p.m.; examined the marks placed upon it for ice-movement; proceeded and camped on the north side of the outer and larger rocky razor-back island well in the bay. Walked to the spit of rocky land to the north-east at the foot of the mountain; ascended 150 feet and examined all round with binoculars; no signs of any rookery. On return journey explored that portion of inner bay north of glacier snout, and reached ship on evening of November 5.

3. *Return journey of western supporting party.*

December 10.—Mr. Ferrar and I, with seven men, left the main party at "Separation ridge" on above date, upon our return to the ship.

On our march we occasionally separated and examined the hills on each side of our route. We found that those more inland were composed of granite rock, split and broken, as well as weather- or wind-worn into extraordinary shapes. The lower or more outer hills consisted of quartz, etc., with basaltic dykes cutting through them. The weather was too foggy to do much upon the sea and old ice in the bay. Reached ship on 18th.

4. *To attempt to reach and ascend "Brown island" and examine condition of things on western side.*

December 29.—Mr. Hodgson, Mr. Ferrar, and I left ship on this date, making our way towards centre of "Black island" in order to avoid the "rough old ice" as much as possible; reached that island after much difficulty, owing to the rough ice and water (due to thaw) on the

31st; continued along the north shore of "Black island" past the north-western point, across the channel, to within 3 geographical miles of "Brown island;" here the sledges could go no further. Walked over the rough lines of rocky *débris* to the island, wading channels in places; ascended to summit, 2750 feet, which was found to be a volcanic cone, with crater. Saw that the glacier at the back of Mount Discovery was not the source of the esker-like lines of rock *débris* and ice-worn boulders, but that it passed away in a long tongue along the shore of the mainland towards the north; also that a long deep bay existed between "Brown island" and the mainland, having Mount Discovery and the plateau mountain at its head; that the channel (?) between "Brown island" and Mount Discovery is choked with lines of heaped-up *débris*.

1903.—Returned to ship round the south of "Black island," and reached it January 8.

5. *To "Bluff," to ascend it and ascertain the lie and general arrangement of the pressure ridges, etc., as the ice passes that point.*

January 14.—Mr. Ferrar and I left ship; found going very heavy, so did not reach the "Bluff," though our course was direct for it, till the 20th. Camped upon the outskirts of long esker-like lines of rock *débris* and broken rough ice, which fringes this side of the mountain range for half a mile or more in extent. Weather now very stormy; could not leave camp till the 23rd. Walked to the land over the *débris*, crossing two movement or shearing cracks along the base of the land; ascended a shoulder near the "Bluff" end to a height of 300 feet, and had a fair view; could go no further, as the weather continued bad, and looked as though getting worse, so returned to camp; left, on return journey, in a blizzard, used sledge-sail, and arrived at ship on 26th.

NOTE ON THE ANTARCTIC SKETCH-MAP, p. 120.—As the complete charts showing the results of the surveys made by Captain Scott and the officers serving under him have not yet been received, the map of the antarctic regions which accompanies this paper must be considered as only provisional. It has been prepared from all the information at present available, including the report which Captain Scott has addressed to the presidents of the Royal Society and the Royal Geographical Society. A rough sketch of the winter quarters of the *Discovery* by Lieut. Barne, and another of Erebus and Terror island by Lieut. Royds, have furnished the basis for the enlarged inset plan, but the remainder of the new work has been drawn from letters and reports, in which are, however, given the latitudes and longitudes of several positions. The track of the *Morning* has been approximately laid down, from a preliminary chart on a small scale, by Lieut. Evans, and sent home by Captain Colbeck. Lieut. Shackleton has, since his return, looked over a proof of the map and made several corrections, but until the complete charts, based upon numerous observations and careful surveys, arrive, it is, of course, impossible to give anything more than an approximate idea of the geographical work of the expedition. Upon the present map, the newly discovered land is shown in red, while the remainder of the coast-line has been principally taken from the admiralty charts and other material.

THE SECOND NORWEGIAN POLAR EXPEDITION IN THE "FRAM," 1898-1902.*

By Captain OTTO SVERDRUP.

UPON learning that Messrs. Axel Heiberg and Ringnes Brothers were willing to defray the costs of a polar expedition under my guidance and direction, I petitioned the Norwegian Government to lend me the arctic vessel *Fram*. The Government at once placed her at my service, while the Storting generously granted 26,000 kroner (= £1445) for the renovation of the ship and the construction of a new saloon forward, two working-cabins, and six berths for the officers and scientific staff. The *Fram* was a first-rate boat before these alterations were made. Prof. Nansen had asked Mr. Collin Archer to make her strong, and strong she unquestionably was. But now she was better than ever; and though she was not so severely tried on the second occasion as she was on the first, still she did not escape without two or three pretty severe tussles.

The original object of the expedition was to spend the winter in the arctic regions, and by means of sledge-expeditions carry out the scientific exploration of the north-west coast of Greenland. But in case the ice should prove unfavourable for this purpose, or we experienced difficulty in penetrating through Kane basin, the generous authors of the expedition gave me a perfectly free hand to turn my attention to other fields. Thus I was under no obligation to follow a predetermined and unalterable plan.

The *personnel* of the expedition consisted of the following, in addition to myself: Captain Victor Baumann, second in command, who was appointed first lieutenant in the Norwegian navy in 1895. He had charge of the magnetic observations, having studied magnetism at Berlin and Wilhelmshafen. The "mate" was Mr. Oluf Raanes, who had served as fisherman and seaman on the Coast of Norway all his life. The cartographer was Captain (*Ritmester*) Gunerius Ingvald Isachsen, a cavalry officer in the Norwegian army. The botanist was a Swede, Mr. H. G. Simmons, who had distinguished himself by a botanical expedition to the Færoes. The zoologist was Mr. E. Bay, a Dane, who took part in Lieut. Ryder's expedition to the east coast of Greenland in 1891. Dr. J. Svendsen, a native of Bergen, was the medical man of the party. The geologist was Mr. Per Schei; and the chief engineer Mr. Karl Olsen, with Mr. Jacob Nödtvedt as his principal assistant. The other members of the party consisted of Messrs. P. L. Henriksen, who accompanied Prof. Nansen in the *Fram's* first voyage; I. Fosheim, our hunter; A. H. Lindström, who acted as cook and steward; S. Hassel, R. Stolz, and O. Braskerud—the last two and Fosheim acted as firemen.

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* Read at the Royal Geographical Society, April 27. Captain Sverdrup's completed map will be issued in a later number of the *Journal;* in binding it should be inserted at the end of this number.

We left Christiania on June 24, 1898, for the Danish colonies on the west coast of Greenland, where we took on board sixty-six dogs, which the Royal Greenland Trading Company had kindly bought ready for us. On August 7 we got set fast in the ice of Melville bay, and were kept there until the 13th. After getting out into open water again, we hardly saw any further trace of ice. Watch after watch passed, and we still had the open sea in front of us, and I was beginning to calculate how many days we should need to go through Kennedy channel and Robeson channel. But I was reckoning without my host. The drift-ice was not so very far off after all, for we encountered it in great quantity in the northern end of Smith sound. At first we tried to creep along by the coast of Greenland, but were stopped by the ice, which lay for a long distance to the north, close-packed and motionless, absolutely impenetrable to any ship that ever was built. There was no help for it; we had to turn round and go back the same way we came. As soon as it was practicable, we crossed over to the west side of Smith sound, and made another attempt to penetrate northwards along the coast of Ellesmere Land; but we were again stopped, on August 17, by the drift-ice, close to the little island of Cocked Hat.

VIEW FROM SOUTH BAY AT HEAD OF CAÑON FJORD.

It was still early in the year, and we hoped the ice would loosen again, so that we might yet be able to push on farther north before the autumn came to an end. But we were doomed to disappointment. Day after day passed, and the ice never moved, and so effectually blocked our passage. Meanwhile the nights began to be cold, a warning that winter was coming, which suggested to us the advisability of looking about for winter quarters. These we eventually found in a small sheltered cove in the northern part of Rice strait. At that time we were still uncertain whether Hayes sound really was a sound or only a large system of fjords, and as soon as the ice bore, which it did early, for the frost was very severe, we set about exploring the interior parts of Hayes sound.

In the following spring we made two expeditions across Ellesmere Land to its west coast. Bay and I, starting from the inner extremity of North fjord (Nord-fjord), travelled the whole way over bare ground, and came eventually to a large fjord which penetrated due east. Unfortunately the weather was not clear, and we were unable to see far; but what we did see distinctly suggested that we were standing at the head of a very large fjord, and that, further to the west, it sent off still larger side fjords to both north and south. But as we had been unable to transport overland a sufficient supply of food for ourselves and the dogs, it was entirely out of the question for us to think of pushing our investigations further. Meanwhile Isachsen and Braskerud started to cross the glaciated portion of Ellesmere Land. Keeping the whole time to the inland ice, they came at length, near the west coast, to a broad belt of bare ground, which stretched right down to the sea, and prevented them from getting any nearer to it. They also saw a large fjord with some islands in it.

In the year 1899 the ice was again extremely unfavourable in Kane basin, filling it entirely from side to side in a densely packed mass; and in those waters, where the ice is almost wholly without movement, you have to exercise the very greatest care lest you get set fast in it. If you do, you will probably have to stay there the whole year, or perhaps even longer. In the condition in which the ice was that summer, if I had attempted to penetrate it, I should almost certainly have set the *Fram* fast, and that I did not wish to do at any price. For if we did get caught, we should use up during the winter such a large proportion of the dogs' food, that, should an opportunity offer in the following summer for pushing on north, we should be unable to do so. For the journey round the north coast of Greenland, and then down its east coast as far as Sabine island, would necessarily require a large number of dogs, and consequently large supplies of food—larger than we should then have at our command. As it was, we did get ice-bound several times; but only in the outer fringes of the pack, so that there was no real danger, for we very soon drifted south down Smith sound, and so got free again. We made several attempts to penetrate northwards, but all ended the same way: we were carried down Smith sound, and so out into open water.

Accordingly, on August 22, we decided to leave Smith sound and turn southwards into Jones sound. For it was by then in the highest degree doubtful whether the ice would loosen sufficiently to allow of our getting further north, and if we remained in Smith sound, there was a risk of our being frozen in for another winter. On the other hand, we knew that there were several extensive stretches of unexplored land lying north of the point where Inglefield turned back in 1852, and thence up to Greely fjord. Belcher, for instance, saw land due north from Table island, which he called North Cornwall. Besides which, there were many reasons for supposing there existed several islands or patches of land in the big bay between Prince Patrick island and Grant Land. In Jones sound we were overtaken by bad weather, with thick fog, and were at last driven to anchor in a fjord which we called Havne (or Harbour) fjord. This, so far as we were able to judge, was somewhere about the spot where Inglefield turned back in 1852, and whence he believed the coast-line ran back in a northern direction.

FROM HELL GATE.

Next spring we resolved to establish a depôt as far west as we could get, so that it might serve as a base for future operations. We succeeded in advancing some 60 odd miles west, but were unable to penetrate further, owing to there being open water as far in that direction as we were able to see. At that point, then, we made our depôt, and christened it Björneborg. On our way back we put into Moskus (Musk) fjord, to see if we could find any game, and were fortunately able to bag twenty-six musk-oxen, which we conveyed in the course of the ensuing autumn the 75 miles which still remained to be traversed to reach the *Fram*.

In the spring of 1900 we sledged west, nine of us, each with his team of dogs. Of these five men were to travel ten days from Björneborg and then return. It turned out that the coast, instead of trending to the north at Sir Inglis peak, continued west all the way to North Kent. It was terrible work forcing our way along close to the coast until we got through Hell Gate, which is always kept open and free of ice by the powerful current which flows through it. To the north of this sound the coast inclined to the north-east, and we followed it as far as Big Bear cape (Store Björnekap), which we at first took for an island, but which eventually proved to be a peninsula. We called the bay which opened to the west, Norwegian bay (Norskebugten). Owing to the mist, we were unable to see very far ahead, but once or twice, when the fog temporarily lifted, we perceived that the coast again turned west, and in the far distance formed the large promontory which we named Cape Sydvest. We thought the coast continued steadily on in the same direction, and suspected Cape Sydvest was on a large island, which was separated from King Oscar Land by a sound. King Oscar Land was the name we gave to the land going northwards from Inglefield's northernmost point.

On March 31 we reached the north side of Norskebugten, almost immediately opposite Eureka sound. There we parted from the five men who were to return to Björneborg, and thence escort two others of our party, namely, Schei and Henriksen, through Hell Gate to the north side of North Kent, whence they were to make an expedition to the Graham islands, and after that explore the large fjords which lay to the north o Norskebugten. After getting through the sound, the cold had become intense. Indeed, the morning our escort left us, we thought we would console ourselves for the parting with a drop of spirits. But though we pulled and pulled at the brandy-flask, not a drop of the liquor could we get. The spirit was frozen into a solid. However, we picked it out with a piece of sharpened wood, and each man had a spoonful of frozen brandy The dram was intended to warm us, but I can't say that on this occasion it had precisely that effect. Although for some time the cold was terrific, we suffered no harm, a circumstance I attributed principally to the fact that we were provided with double tents. After we got a little better seasoned, and learnt how to take care of ourselves, we succeeded in almost entirely avoiding the moisture which adheres to the clothe in those climates, and which has generally occasioned such discomfor to all previous arctic travellers. Owing to this cause, we were generally pretty comfortable on our sledge journeys. Continuing our route west towards Cape Sydvest, we had the same difficulty in making head way that we had had ever since we left the sound. It was as much a ever we could do to manage 7 or 8 miles in a day. Beyond Cape Sydves the coast turned towards the north-west, and the four of us who were now left pushed on further, notwithstanding the mountainous character of the country, until on the morning of April 15, just as we were setting off for the day's tramp, we discovered fresh land due west.

We agreed to separate, Isachsen and Hassel proceeding to explore the new land we saw to the west, while Fosheim and I continued our sledge tour. The former, after exploring the new land, were to cross over the large bay which lay on the north side of Cape Lev-vel, where we separated; for this bay extended, we saw, a long way to the east, and it was possible it might end in a sound that would bring us through to more easterly waters. But if they failed to discover any such sound, they were to return the same way they went, and visit the large fjords which we perceived opening to the north of Norwegian bay.

FROM HELL GATE.

Fosheim and I continued, then, towards the north; but, the weather still proving bad, we made even shorter days' journeys then we had counted upon. We were, however, allured on by the continual hope of reaching the northern extremity of the land, and finding there a sound or fjord which would take us east into Greely fjord, or into the waters we had visited in the spring of 1899. But time after time we were disappointed, and on May 7 we were compelled to turn back in about 81° N. lat. and 95° W. long., owing to our food and that of the dogs beginning to run low. The coast still continued to follow the same direction as far as we could see—that is, for some 15 miles or so further north. On May 7 we set out on our return journey, and on June 3 were once more on board, after an absence of seventy-six days.

On June 19 Isachsen and Hassel returned. They had made a short visit to the new land westaway, and on their way back had ascertained that there was no sound stretching to the east from the large bay that lay north of Cape Lev-vel. From Norskebugten they entered what they took to be a large fjord running towards the north, and followed it up very nearly as far as 79° N. lat., or, in fact, until they judged, as well as the incessant bad weather would let them, that they had reached the head of it. After that, in the same way, they travelled to the extremity of the large fjord which penetrated westwards. Then continuing south along the edge of the land that lay to the east, they passed, but did not enter, a little north of Björnekap Land, another broad fjord which pointed towards the south-east.

Schei and Henriksen returned from their journey to the Graham islands the day before we reached the ship, having been absent seventy-five days. They too had entered the same large fjord that Isachsen and Hassel had done, but had not gone further north than Björnesund, in about 78½° N. lat. On their return journey they crossed over Björnekap Land, and struck Norskebugten a little west of Store Björnekap.

As soon as the ice broke up, we steamed west and went up Cardigan strait, and on August 15 once more got fast in the ice off the north shore of Grinnell island, (not Grinnell Land, of course). But, after drifting backwards and forwards for about a month, we came free again, and steered to the head of Gaasefjorden (Goose fjord), and there pitched our winter quarters for the third winter.

Our sledge journeys of the spring preceding, especially after the results we obtained from them had been embodied in map form, convinced us more and more that there must be a fjord or sound connecting the northern part of Norskebugten with Greely fjord; and if, as we believed, we now possessed a fairly accurate knowledge of the waterways to the west of Björnekap Land as far north as lat. 81° N., it was tolerably certain that the sound in question, supposing it really did exist, must start somewhere farther east. We concluded, therefore, that it was in all probability a northern branch of the great fjord which went in a south-easterly direction from Björnekap Land—that is to say, an arm of the fjord which both Isachsen's and Schei's parties had visited the previous season. The probability seemed to be that, after going a little way east, it would turn north, and be somehow connected with the waters which we had discovered when we went overland west from Hayes sound during our first year. And it also seemed probable that the same fjord would prove to be connected with Greely fjord. These problems demanded a solution at all costs, and I determined to tackle them myself. Whilst I was doing this, Isachsen and Hassel agreed to return to the new land we had discovered westaway, and to which we gave the names of Ellef Ringnes Land and Amund Ringnes Land. Even before the autumn closed we attempted a reconnoitring trip to the north, but were unable to surmount the difficulties incident to the constant bad weather, and the repeated breaking up of the ice. As far as we could see from Nordstrand, almost the whole area of Norwegian bay was a bright blue sea.

In the spring of 1901 our first proceeding was to travel to Baumann fjord, and establish there a depôt, and thence journey some distance to the north. Both going and returning we entered the fjord which, on the south of Store (Great) Björnekap, cut eastwards into the land, and, crossing over an isthmus near its head, came to another broad fjord, which penetrated first eastwards and then due north. At first, we were naturally disposed to think this was the sound we were in search of; but after driving up it for some days, we became convinced not only that it was a cul-de-sac, but also that it was impossible there should be a land passage from this fjord in the direction we had anticipated. There was no alternative: we had to turn and go back the same way we came. Heading our dogs towards the north-west in the direction of Storfjorden (Great fjord), we entered a long narrow rift or waterway, which struck off from the east side of this fjord and led towards the north. But here again we were disappointed. It too was apparently a cul-de-sac, and terminated at the foot of a precipitous mountain wall, which it would be impossible to climb. We called this Trold fjord, and

VIEW FROM BERTSTAD FJORD.

well it deserved its name; it was an ugly place, being shut in on both sides by high and gloomy walls of rock, which wore a very threatening aspect. Here again there was manifestly no possibility of advancing further by land. However, as we had already come so far, we decided to pursue the fjord to its extremity. If fortune would only favour us, we might perchance hit upon a little glen or gap of some kind that would take us to the north. On we went then, and just as we were spinning round a projecting cape, suddenly the mountain wall opened like a doorway, and there, straight before us, was a valley which ran first to the east and then to the north. We had no hesitation in following up the valley, and after some difficulty we succeeded in striking a large fjord on the north side of the land. It was, we felt perfectly certain, one of the waterways we had visited during our first spring, and so we pushed boldly on. We were two sledging parties travelling together, the intention being to separate as soon as it should appear expedient to do so. This, then, was the moment to do it. Accordingly we parted company on May 4 near the Blaamanden. Whilst Fosheim and the mate travelled northwards towards Greely fjord, along the land that lay to the east, Schei and I stuck to Axel Heiberg Land, intending to push on as far as we could towards the north. We advanced as far as lat. 80½° N. without change of direction; then, however, the coast turned suddenly towards the west, and after we had proceeded some distance farther, we came to ice which, especially as the weather was at the same time so bad, we were unable to get over. Hence we were compelled to turn back long before we expected to have to do so.

When the weather cleared up, we ascertained that there was a broad sea-channel running towards the north-west, and that Axel Heiberg Land extended as far to the north as we were able to see. The northernmost point we reached was Smörgrautberg. Looking hence, we perceived that Greely fjord penetrated Grinnell Land towards the north-east, and was confronted on the west by an imposing mountain chain, which for almost the entire distance that we could see descended perpendicularly into the ocean. There were also several fjords cutting into the land in a northerly direction. On the other hand, Heiberg Land, so far as we were able to command a view of it, was relatively low, scarce rising more than 1500 to 2000 feet above sea-level, and between these altitudes and the sea stretched a wide belt of actual lowlands. Although Heiberg Land held out every promise of an abundance of game, we were, as it happened, still well supplied with provisions; and as, besides, the season was getting on, we thought we could employ our time to better advantage by exploring more thoroughly those parts of the country which lay to the south of us. On our way north we had scarcely given ourselves time to stop anywhere—our one object had been to push on and get as far north as we possibly could. However, we were concerned

GULL MOUNTAIN ON WEST SIDE OF GOOSE (GAASE) FJORD.

not merely to determine the boundaries of Heiberg Land, we desired also to explore it. It was penetrated by several large fjords from various directions, and it would not be without interest to explore these somewhat more closely.

We started on our return journey on May 13. Immediately south of the Blaamanden, the place, it will be remembered, where we separated from our two companions, Fosheim and the mate, but on the other side of the fjord, the flat lowlands were cut into by another large but narrow fjord-like inlet. It appeared to penetrate to a great distance, but how far exactly we were unable to see owing to the low elevation of the land. This was a point we wished to clear up; besides, it would be interesting to examine the wide lowlands which stretched away from the inlet to the south and east. The west side of the inlet was, on the contrary, shut in by high mountains, amongst which I fancied for some time I could perceive glaciers, though it turned out subsequently that I was mistaken. One night, whilst we were still in this neighbourhood, we were suddenly attacked by a pack of about a dozen wolves. Unfortunately, our dogs were muzzled, to prevent them from gnawing their traces, so that they were unable to defend themselves, and came within an ace of being all worried to death.

On our way south, we put in at several branch fjords, believing all the time that the channel we were travelling down lay to the east of the Storfjorden. Our surprise may, therefore, be imagined when we discovered, as we did eventually, that it was Storfjorden itself we were in. The identification was, however, undoubted, for

Schei recognized again the spot where he had encamped the year before, close to Björnesund. If only we had been aware of this when we started, we should have been enabled to obtain a very different idea of the lands which lie west and north of Greely fjord. The longest of these branch fjords, which we called Skaare fjord, extended some 28 miles in a north-west direction. Whilst we were encamped at the head of this fjord, we were assailed in the middle of the night by a terrific storm, which drove us to seek shelter in a sort of cañon we had discovered on our way up the fjord. The wind was so violent, it literally blew the sledges along the ice, and at such a pace that we had difficulty in preventing them from being overturned, while the snow fell so thick and fast that we were scarce able to see an inch before our noses. However, we luckily made the cañon without mishap. Crossing the sandbank at its entrance, we proceeded a little way up the glen, and could readily have believed we were come into—paradise: it was perfectly still, not a breath of wind.

After that we crossed the Hyperite peninsula, and from thence reached the northern parts of Björnekap Land, and then travelled south along this last. At two places in this district we found big accumulations of fossils, and from Björnekap we each took a big sledge load of rock specimens home with us. It was June 18 when we got back to the *Fram.*

Isachsen and Hassel had reached the ship on June 7. The chief results of their expedition to the lands westaway were these: They ascertained that they extended as far west as about 106° W. long.,

TWIN GLACIER.

and as far north as approximately lat. 79°. They were almost entirely of low elevation, barely being more than 500 feet above the level of the sea. The coasts which fell away towards open water were so low, it was sometimes not at all easy to distinguish where the land ended and the ocean began.

In the mean time Baumann and Stolz had mapped Baumann fjord.

This summer we fully intended to return home, but in this we were deceived, for the ice never broke up in Gaasefjorden (Goose fjord). We tried, of course, to force our way out by ramming, but the ice was too thick. Then we attempted to blast it with explosives, but with no better result. And even if we had succeeded in breaking the ice, we should have been in no better position, for there was no room to push it on one side out of the way. After a month's hard work, we gave up the attempt on September 6, having cut through about 9 miles in all, and there were still 5 or 6 miles before we could reach the open sea. This was a severe blow to us all. We had fully counted upon reaching home that autumn, and the only thing which prevented us was that paltry 5 miles of ice, for that year Jones sound was freer from ice than we had ever seen it before. However, it was no use lamenting, so we set to work at once to lay in a stock of meat to keep the dogs alive during the winter. Since we were to stay another year amongst the arctic ice, we had better turn the time to some good purpose. We could do nothing without the dogs. So we dragged a boat across the belt of ice, and got her ready

NORTH CAPE AT ENTRANCE TO BAY'S FJORD.

for hunting walrus. We had another whale-boat lying at our fourth camp on the north side of the land. Four of us therefore crossed overland from the head of the fjord, and sailed the second boat south through Hell Gate into Jones sound. Then we established a fishing-station at Maasefjeld, as we called the steep cape at the west side of Goose fjord. As soon as we had finished our preparations, we discovered that the first boat's crew had done precisely the same thing, but that at the moment they were absent, having gone up the fjord with a boatload of walrus-flesh. All the time we were engaged in catching walrus, there was, fortunately for us, a stiff breeze blowing from the north, which kept the fjord open. But, the frosts setting in towards the end of September, we soon had to give over; however, we had done very well, and had quite enough meat to last us through the winter. With the view of shortening the distance we should have to sledge the meat, we took it round to the outer isthmus, and there left it until the ice was strong enough for sledging.

In the following spring, Baumann and two other men went to Beechey island to find out if there was anything left of the large depôt which the English made there half a century ago. On his return he reported that the depôt was entirely destroyed, except for a few fragments of the house which the English built. The sloop *Mary*, which had been left there drawn up on land, was also entirely destroyed; amongst other things, her mast had been sawn off. Isachsen and Bay explored and mapped the unknown parts of North Devon, and reached the *Fram* again on May 22. Meanwhile Schei and I proceeded up Eureka sound, and mapped those districts west of Greely fjord which had not already been mapped, and were back again by June 16. In this expedition we were fortunately able to determine the northern boundaries of Axel Heiberg Land, as well as the previously unknown coasts that lay west of Greely fjord. The northern parts were appreciably lower than the districts in the south, and consisted of low rounded hills and ridges (*aas*) of gravel, with immense sandbanks stretching beyond a long way out to sea. These numerous eminences, with the broad shallow valleys between, gave the region the appearance of having been originally an archipelago, which had subsequently been raised above sea-level.

The northern part of Axel Heiberg Land was not particularly high, presumably, as I have already said, not much above 1500 feet. Nevertheless, its coast fell for considerable distances vertically into the sea. Its northernmost point lay in 81° 20′ N. lat., and its westernmost in about 95° long.

From the farthest point north to which we advanced, namely Land's-Lok, in about 81° 40′ N. lat. and long. 94° W., we were unable to see land in any quarter, either towards the north or towards the west. The new islands which we discovered would therefore appear to form the natural termination of the polar archipelago that lies north of the American continent. Although I am not prepared to assert there really does exist no land to the north or west of the point I have indicated, I have no hesitation in saying I think it extremely unlikely that land will be discovered in those directions, for as far as ever we were able to see, there was nothing but sea, covered with ice of the usual coarse arctic character. It is true, the ice was forced up against the land in pressure ridges to an almost inconceivable height; still, that is not enough to justify the conclusion that there exists no land farther west, for the drift-ice can be forced up in this way without having an extraordinary amount of sea-room behind it. In fact, I have nowhere seen such gigantic pressure-ridges as those we encountered along the stretch of coast between Cape Sydvest and Cape Lev-vel, and those ridges were caused by pressure coming from the west and south-west.

COAL FJORD.

During the whole course of the expedition we never saw anything that might be described as palæocrystic ice. The entire distance from Land's-Lok to Smörgrautberget was packed with old arctic ice which had been subjected to great pressure. Its appearance suggested that, at any rate in the summer of 1901, the entire region had been covered with ice, for the great ridges were all rounded off as they would be if the ice had melted on the surface. The first year, too, that we visited that part of the coast the old ice covered every inch of the distance between the Blaamanden and the

Smörgrautberget, and even extended beyond the latter for as far as we could see. During the autumn of 1900 the ice had been subjected to an immense pressure; in fact, from the sledge-traveller's point of view I never did see worse ice anywhere. It was quite clear, however, that open channels do exist in these waters. We had unmistakable proofs of them during our trip from Land's-Lok to the northern part of Axel Heiberg Land, for there one had run diagonally right across the fjord, and we travelled the whole way down it, until we reached the land, on new ice only one winter old, and actually followed it some distance further south, for it continued to run parallel with the coast. I feel pretty certain that in most years there is here a belt of open water running from north to south, for although the ice was extremely unfavourable in the previous summer, there had nevertheless been an open channel, for in many places we found ridges of new ice pressed up between the old. There was old ice also along the west coast of Heiberg Land; but mile after mile there had, during the preceding autumn, extended a narrow channel or lane of open water, for we observed there a good deal of new ice amongst the ice-ridges. We also encountered very old arctic ice off the north side of Isachsen's Land and Ellef Ringnes's Land, where it was driven close in to the coast, and even upon it, in a series of parallel ridges of formidable dimensions.

Throughout the whole of the long distance from Blaafjeldet to Land's-Lok we did not observe the remotest sign of a glacier, nor was there any indication of glacial formation on the other side of the sound until we reached Skaarefjord, and discovered a glacier-tongue a little way up the glen. We subsequently found another glacier-tongue in Ulvo fjord, and others in a few places between Hyperite peninsula and Cape Sydvest. I scarcely think that any real glaciers were found on Axel Heiberg Land, any more than on the newly discovered islands westaway. On the other hand, a considerable part of King Oscar Land is covered with glacial ice. But in no place along the actual coast did we find glacier-tongues reaching down to the sea; there was everywhere a broad belt of lowland between the glacial ice and the water, but Fosheim and the mate noted one large glacier reaching down to the water in Cañon fjord. On the south of the land the case was, however, quite different, for there the inland ice capped large stretches of country, while numerous glacial arms descended into the valleys, though seldom far enough to reach into the actual fjords.

Appearances seemed to indicate that the precipitation was very small, and I believe it is considerably less in the channels near Eureka sound and to the north of it than, for example, on the west side of Axel Heiberg Land, where it would sometimes seem to be not inconsiderable. Yet even there it is nothing like sufficient to furnish material for inland ice.

In many parts of the newly discovered lands there would appear to exist an abundance of animal life, especially musk-oxen and smaller game, such as hares and ptarmigan, as well as foxes and wolves. The larger animals keep principally to the inner parts of the fjords, because it is there they find most readily such means of sustenance as they require; but there are also several parts of the coast which they frequent in large numbers. This is especially true of Björnekap Land and Schei island. Reindeer exist away to the west, but in scanty numbers. The only other district where we met with them was in Björnekap Land, and, as a rule, their numbers decreased as we advanced north. On the west side of Axel Heiberg Land we again saw numerous traces of reindeer, but no indication of musk-oxen. All the same, I do not doubt that musk-oxen would be found by proceeding a little way up the fjords, for we had abundant evidence that animals of all kinds were plentiful enough throughout the whole of the east coast of that land. I got the impression that the reindeer are only summer visitors in those parts, and that they come there in the spring from lands farther to the west, and return again in the autumn as soon as the ice is strong enough to bear them. But this is only a surmise; I have no positive information bearing upon the point. Bears also were pretty numerous in certain localities, both in Jones sound and all the way along the coast of King Oscar Land northwards from Eureka sound. But on the west side of

BOAT CAPE ON NORTH DEVON.

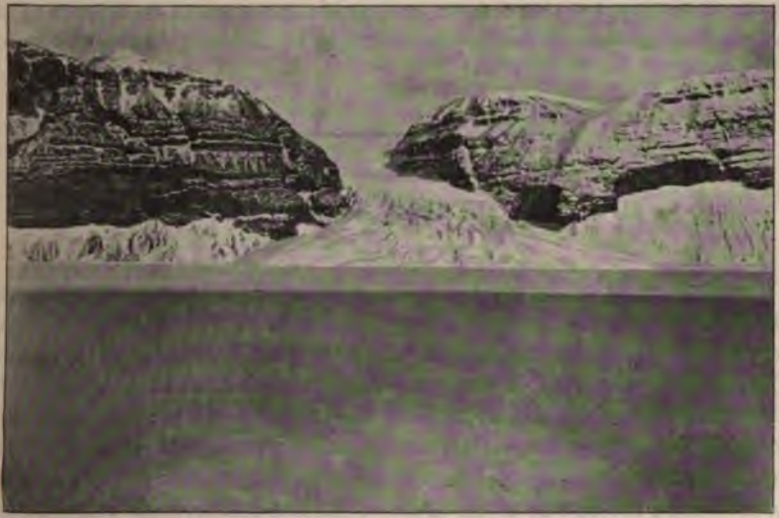
Axel Heiberg Land we did not observe the slightest trace of these animals north of Cape Sydvest.

Almost everywhere we discovered the remains of Eskimo habitations, winter houses built of stone and whalebone, as well as traces of tents, meat cellars, and fox-traps. These occurred upon almost every headland along the south and west coasts, and we also came across indications of human beings having visited the inner parts of the fjords. In the course of our expedition overland from Norfjorden to Bay's fjord we several times observed the circular markings where tents had stood, proving that the Eskimo were well acquainted with that region, and had made good use of this short cut overland. On the east side of Axel Heiberg Land again we observed several indications of Eskimo having visited the region; indeed, there were even tent-markings along the coast between Greely fjord and Land's-Lok. On the other hand, we found no signs of even temporary occupation on the west side of Axel Heiberg Land. Curiously enough, at Björneborg there were, besides the usual Eskimo remains, two round towers built of stone. Presumably they were constructed by the Eskimo, although I confess I have never seen structures similar to these that they have built anywhere else.

With regard to the route which the Eskimo followed in their migrations into Greenland, it would, of course, be rash to say anything positive. Yet it is not improbable that the main stream followed a north-east direction across the North American archipelago, *viâ* the northern parts of North Devon, and thence north along the coast of King Oscar Land, through Eureka sound, into Greely fjord, then overland to Archer fjord, and so on northwards to the north-west coast of Greenland. Of course, this does not exclude the possibility that a smaller stream may have preferred to keep to the coast, and so gone right round Grant Land, and in that way reached the north-west coast of Greenland, whence they would continue round its north coast, and so push on down its east coast. I should also be strongly inclined to suspect that a portion of them may have crossed overland from Bay's fjord to Hayes sound, and thence proceeded across Smith sound to the west coast of Greenland, and so on further south. It must be left to the future to decide how far these points are capable of being cleared up by a scientific examination of the various objects of wood and bone which we discovered, besides the different remains and encampments, as also the solution of the age of the remains themselves.

The scientific results of the expedition have, I venture to say, been of considerable value. Meteorological observations were taken every second hour, both in summer and in winter; records were also made of the temperature of the sea and of the ice, as well as of the tidal water. Magnetic observations were made at each of our several winter quarters. Collections of the greatest possible extent were made by the scientific staff, and they brought home with them rich and valuable materials for the study of the zoology, botany, and geology of those new lands, parts of the arctic which had never before been visited.

Stubborn and intractable though the ice was in Goose fjord in 1901, in the following year it proved just as ready to serve us. By July 30 we got out to the entrance of the fjord; but had to return, because the prevailing east wind had packed the ice together in such vast masses outside the fjord, that it was impossible for us to get through. Besides, a boat party who had gone off for the purpose of scraping the bottom of their boat, were not yet back on board. But on August 6 we said good-bye finally to Goose fjord, and on the 17th entered Godhavn without having met with the slightest hindrance from the ice, either in Jones sound or in Melville bay. We left Godhavn on August 21, and reached Norway on September 19, 1902, after an absence of four and a quarter years.



GLACIER IN BOAT FJORD.

Before the reading of the paper, the PRESIDENT said: Our meeting this evening is one of considerable importance. We are here to receive an account of some very important arctic discoveries from the leader, the distinguished Norwegian seaman, Captain Sverdrup. I am sure you will give him a very warm welcome this evening, and also Mr. Schei, the geologist of the expedition. Captain Sverdrup, as you all know, has been well known to geographers for a considerable number of years from his work with his old friend, Dr. Nansen, and he now comes back after four and a quarter years of very hard work, which he and his companions have done resolutely and admirably. As soon as we thoroughly understood what had been accomplished, it was considered by the Council of our Society that Sverdrup had become worthy of our highest honour. (*Addressing Captain Sverdrup*) Captain Sverdrup, on the part of the Council of the Royal Geographical Society, I am glad to be able to tell you that they have so highly appreciated your work in the arctic regions that they have resolved to grant you the highest honour we have it in our power to give, and that is the Royal Award. As you will not be able to be present at our anniversary meeting, the Council has desired me to place in your hands on this occasion the Patron's Medal of the Royal Geographical Society.

Captain SVERDRUP: I thank you very much for presenting me with this medal, and I will ask you to read my paper.

The PRESIDENT: Captain Sverdrup thinks that he has not sufficiently mastered our language for him to venture to read the paper to so large an assembly, and he has therefore requested me to do so for him.

After Captain Sverdrup's paper, the PRESIDENT said: Mr. Schei, the geologist of the expedition, has also been so kind as to communicate a short paper on the geology with reference to the physical geography of the newly discovered country. I will now read Mr. Schei's paper.

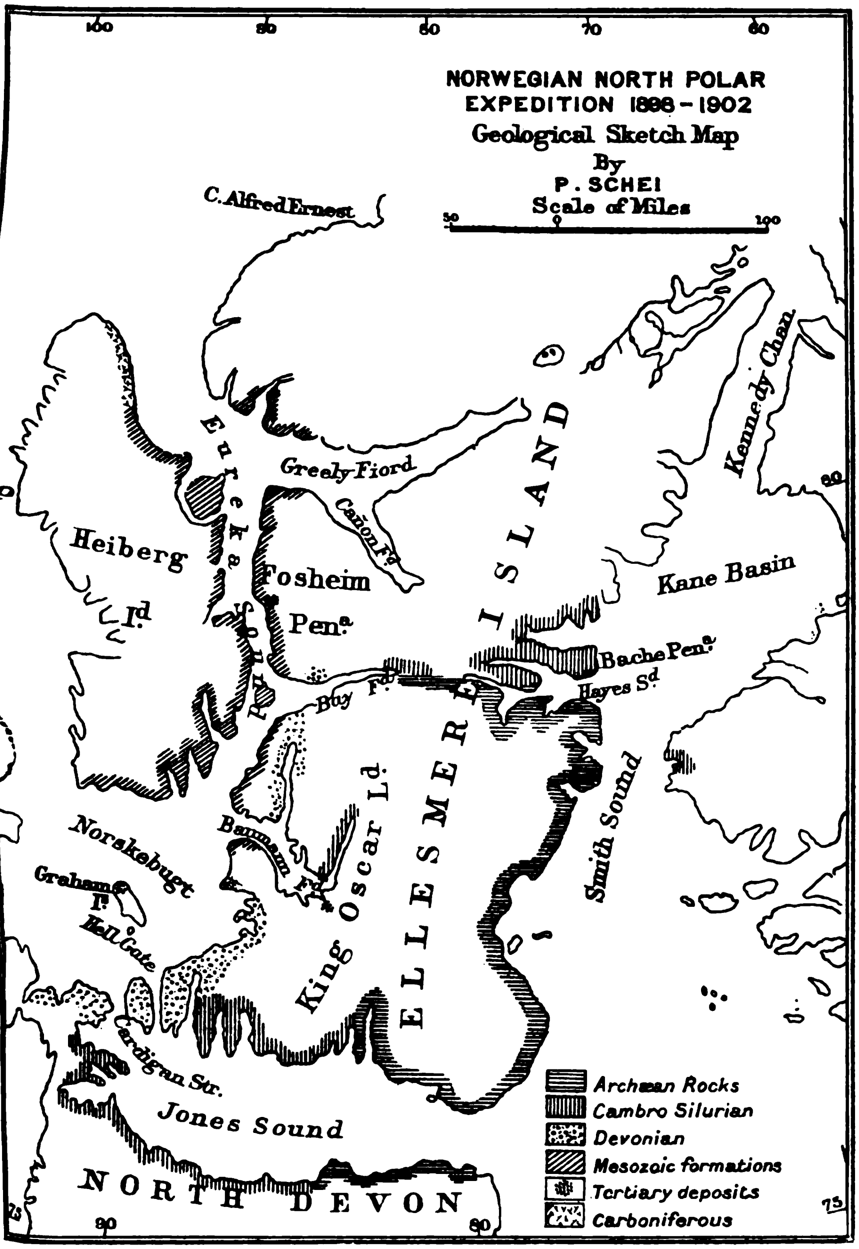
SUMMARY OF GEOLOGICAL RESULTS.

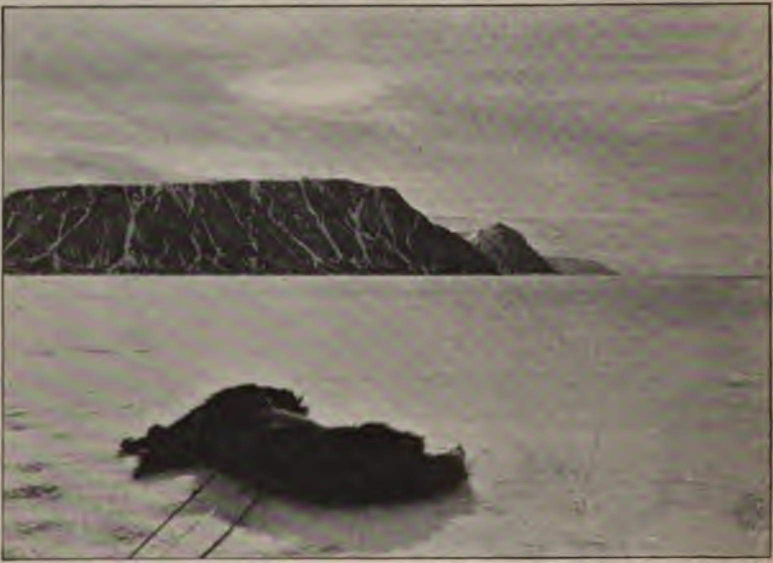
By P. SCHEI.

YOUR Society has done me the great honour of asking me, through my chief, Captain Sverdrup, to give it an account of the scientific work accomplished by the expedition. This request I have all the greater pleasure in complying with, because your Society, and behind it the English people, have a clear right to early information about anything there is new to be known about the regions specially visited by the Second Norwegian Expedition. For it is to both your Society, with its never-failing interest in arctic exploration, and the English people, with their unparalleled generosity in raising the necessary funds, that one of the greatest and noblest undertakings in the field of geographical exploration during the nineteenth century was carried out—Sir John Franklin's Expedition for the discovery of the north-west passage and its sequel, the Franklin Search Expeditions. It is to these last that we owe whatever knowledge we possess of the Parry archipelago. At the same time, it is but proper to mention in this connection the last exploit in arctic exploration in particular, and of the scientific investigation of nature in general, which Englishmen have accomplished in that part of the world—I allude to the expedition under Sir George Nares's command in 1875–76, which brought home so many interesting collections and observations from the east side of Ellesmere Land and Grinnell Land.

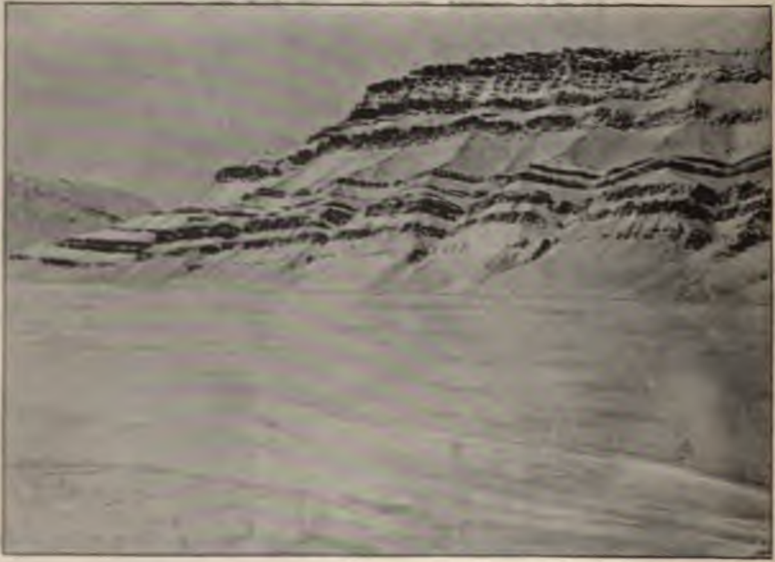
The second expedition of the *Fram* had the good fortune, under the stress of circumstances, to be forced to spend four years on the borders, that is to say, the regions lying between the parts explored by the two great expeditions.

Thanks to the more stationary nature of its operations, as well as to the advantage of being able to employ more modern appliances and methods, and above all to the use made of dogs in sleighing expeditions, the second *Fram* expedition has been enabled to collect on the whole a





ARCHÆAN PLATEAU, SOUTH-EAST ELLESMERE LAND, JONES SOUND.



SHEETS OF BASALT IN LIMESTONE AND SANDSTONE, EUREKA SOUND.

GLACIER IN BERTSTAD FJORD.

pretty large quantity of scientific material. Indeed, of such an extensive character is it, that as yet a good deal of it has not been examined scientifically, some even has not been distributed for examination. All that can be said here, therefore, is that meteorological observations, embracing observations on the direction of the wind and its velocity, the temperature of the air, its pressure and its degree of humidity, as well as the amount of cloud, were taken every second hour from September, 1898, to August, 1899; from September, 1899, to August, 1900; and from September, 1900, to July, 1902, in the several winter quarters we wintered at.

Observations were also taken of the tides at various periods, with the object of determining the magnetic force, and pendulum observations.

The zoological collections, which were made by Mr. Bay, embrace a large number of preparations and specimens, amongst them 2000 preparations preserved in spirits. Of these, the collections of the lower forms of life, especially echinoderms and phankton, may be particularly singled out for mention, both on account of their great variety and the special interest they inherently possess.

The collections of plant life made by Mr. Simmons embrace no less than 50,000 examples. The collector has reserved to himself the study of the phanerogams and algæ, leaving the remainder to be taken in hand by various specialists. This great wealth of material may be expected to yield, besides a host of individual facts, an almost complete survey of the botanical geography of that particularly important part of the world.

As regards the geological results, here alone I am able to offer detailed information. My collections embrace specimens of Archæan rocks from Foulke fjord and the south side of Hayes sound, as well as of the Cambrian and Silurian formations, which are developed to a great thickness in Bache peninsula and on the north side of Princess Marie bay. A pretty complete collection was made of the Silurian and Devonian formations which occur in the western part of Jones sound; and they have furnished materials for determining in considerable detail the order of the series in these two formations. Most of the localities examined in Goose fjord and Hell Gate were prolific in fossils. Here we have a series the several members of which yielded 16, 11, and 22 species respectively on a first provisional examination, belonging apparently to the Wenlock and Ludlow divisions of the Upper Silurian; while the members of the Devonian series have supplied 55, 20, 13, 16, and so forth, species again on a preliminary survey. This takes no account of the remains of fishes, which have not yet been identified, though Prof. Traquair, of Edinburgh, has kindly undertaken to examine them; nor does it embrace, either, the specimens, abundant in numbers, but poor in species, of Upper Devonian plants which were gathered in three localities in Goose fjord, and which Prof. Nathorst in Stockholm has undertaken to report upon.

HIGH-LEVEL COAST FORMATION, HEAD OF BAY'S FJORD.

We also brought home an important collection of Upper Carboniferous fossils from Big Bear cape (Store Bjornekap), which have gone into the hands of Prof. Tshernytcheff, of St. Petersburg. Here are at least forty species, some of them represented by several specimens, and all of especial interest, owing to their resemblance to fossils from the Upper Carboniferous rocks found in the north of Europe.

Great interest attaches also to the collection of specimens belonging to the Mesozoic deposits of Eureka sound. Thanks to Sir Leopold McClintock, Vice-Admiral Sherard Osborn, and Sir Edward Belcher, we already knew of the existence of a few Mesozoic fossils in the Parry islands. My Mesozoic collection contains, therefore, nothing new; and as the collections are small and incomplete, they do not afford anything like materials for a complete summary. They do, however, prove this —that the Mesozoic deposits of King Oscar Land, Heiberg Land, and Grinnell Land are very widely distributed, as well as possessed of greater intrinsic importance than the similar deposits in other parts of the North American archipelago, since they point, as do also the Carboniferous fossils, to North European affinities rather than to American. At Cape Blue Mountain (Blaafjeld) I picked up a black shale containing a *Daonella*, and both rock and fossil are precisely similar to a rock and fossil from Spitzbergen, where Alpine Triassic is known to exist.

TABLE-TOPPED HILLS OF DEVONIAN FORMATION, HELL GATE.

Prof. Nathorst says that the Tertiary plant remains which Mr Simmons has brought home from Coal fjord (Kulfjord), in Baumann fjord, are in their several ways unparalleled. Out of two or three large pieces of greyish-black clay he has succeeded in washing out portions of stems with their adherent leaves, and has mounted them upon cardboard just as though they were parts of a dried plant which was plucked only the other day. Thus he will be able to examine microscopically the structure of both the leaves and stem of plants which grew, it may be, a million of years ago in a part of the world where at the present day there does not exist a single tree, and which have for their nearest known congeners the giant tree of California, *Sequoia*, and the swamp cypress, *Taxodium*, of Florida.

In the light of these various fossil collections, we are now in a position to interpret the history of this portion of the Earth's surface during pretty long periods.

In North Lincoln Land, and both northwards to Hayes sound and westwards as far as Harbour fjord, there exists an Archæan formation built up out of granites of a peculiar character by ancient volcanic outbreaks, and over this there flowed in Cambrian times a sea, which has in part worn away the outlying Archæan rocks. We have thick quartz sandstones in Bache peninsula and in Foulke fjord, and we have reports of still greater developments in Inglefield gulf, North Somerset, etc.

In part the Cambrian sea would appear to have washed the feet of limestone mountain walls, which were formed and deposited long anterior in water; for interpolated between and lying upon the sandstone in Bache peninsula and Jones sound there exist conglomerates of limestone and of calcareous sandstone hundreds of feet thick. After that the sea overflowed these localities, and deposited, in the Middle Silurian epoch, thick strata of limestone, at least 2000 feet deep, in, *e.g.*, Princess Marie bay and Jones sound.

During the early portion of the Devonian epoch, the formations of the deeper seas were laid down in the form of black shales and limestones; but by the close of that epoch the coasts had approached nearer together, and in the quieter deeper reaches of the estuaries fish remains settled down, along with fragments of the plants which grew on the adjacent shores, and both were buried in the argillaceous mud which collected amongst the sand and gravel along the shore.

The richly fossiliferous limestone, with embedded flints, which exists at Big Bear cape, tells us that at the close of the Carboniferous era the sea was again predominant, although of the circumstances which existed immediately before and immediately after that epoch we know nothing. Ammonite mountain, in the northern part of Bear Cape Land, records that in Triassic times the sea reached quite close up to that spot, for its sandstones and arenaceous limestones contain lamellibranchiates and an ammonite of that age. But about the close of the Triassic epoch, or a little later, this part of the Earth's surface underwent tremendous changes.

The Blackwall (Soote Vaeg), in the north of Heiberg Land, shows that volcanic craters were already in existence there in Carboniferous times, and spouted out lava, which spread itself in broad streams over the layers of limestone and flint. The existence of tuff strata intercalated between the lava-beds shows, further, that the volcanic outbreaks were accompanied by showers of ashes. However, the Carboniferous sea once more asserted its supremacy, and laid down fresh strata of flint and limestone on the top of the tuffs and lavas. But the volcanic disturbances did not reach their culmination until after the Triassic deposits were all laid down. The Earth's crust was split by gigantic fissures, and the several areas thus formed were dislocated both horizontally and vertically, but more particularly the latter. At the same time volcanic matter burst up through these fissures and forced its way in between the sedimentary fossiliferous rocks. In virtue of their greater power of resisting disintegration, these intrusive outflows now appear in the form of black strips and vertical walls, interpenetrating the more yielding contours of the sandstone and limestone strata. This volcanic activity, as well as the most violent dislocations, seemed to have been confined to the immediate vicinity of Eureka sound.

HARBOUR FJORD, JONES SOUND.

Ellesmere Land and King Oscar Land have the contours of a tableland. The younger formations of North Lincoln Land are separated from the Archæan rocks. The level surface of the latter lies at the same elevation as the subsided sedimentary strata on the west and the north. But at Eureka sound the plateaus have steep vertical sides, and have been disturbed by the eruptive outbreaks, imparting a more rugged aspect to the landscape, with sharper edges and isolated peaks.

The Miocene sea deposited its clays and sands in the valleys and depressions of the dry land, which owed their existence to dislocation and erosion. It is in these deposits that we have found the splendidly preserved remains of former vegetation to which I have already alluded, those allied to the giant *Sequoia* of California and the swamp cypress of Florida.

The youngest evidences of marine action are the sands and clays, with sub-fossil remains of existing marine organisms, which were observed at an altitude of 650 feet all round the coasts of Ellesmere Land. The altitude to which that sea rose is indicated for the most part by the loose materials of the marine terraces, although traces of it are not wanting in the hard rock, namely, in the form of a flat shore formation, in, *e.g.*, Baumann fjord and to the north of the Seventeenth of May hill (Syttende Mai Haugen). The same phenomenon is exhibited in the foreland, which, to the breadth of 1 to 3 miles and to the height of 650 feet, encircles the plateau, especially in many localities in Eureka sound. It is also remarkably plain to see on Graham island.

One of the principal features of these regions is, of course, their glaciation. North Lincoln Land is, as we know, glaciated. The interior is covered by a more or less continuous sheet of ice, and from it big glaciers push themselves down into the sea from Fram harbour in Jones sound right round to the inside of Hayes sound, although in the latter locality there are considerable areas entirely free from ice. The same thing is true in even a more extended sense in the districts bordering in Jones sound. The glaciation becomes less pronounced as one advances west. First the glaciers retreat from the actual coast, and finally disappear altogether. The higher parts of the interior of King Oscar Land are, it is true, covered with ice, but it is so thin as to be unable to give off any glaciers. In the usual acceptation of the term this land is not "glaciated," and the same thing is true of the west of Grinnell Land and of the greater part of Heiberg Land. The only exception in the case of the last named is the south-east corner, where, however, scarce a single glacier reaches the sea. So far as I am able to judge, this reappearance of glaciation in the regions farther west is due to the relatively greater precipitation, but principally to the configuration of the country. I fancy the wind drifts the snow together and deposits it on the short, steep slopes which are here found to exist, but nowhere else. You never find a thick ice-cap on the level heights or on the top of the plateau.

From what is stated above, it will be inferred—what is, indeed, true—that in the summer extensive tracts of country are entirely free of both snow and ice.

After examining the unglaciated parts of the region with the view to discovering whether they may possibly have been subjected to glaciation at some earlier period, I arrived at results of a negative character. I nowhere observed *roches moutonnées*, neither did I observe striæ or scourings. Nay, further, I did not perceive any loose materials that could with any degree of likelihood be ascribed to the effects of glacier ice. Moreover, in several places I noticed marine terraces at a great height above the sea, running immediately in front of the existing glaciers, and in such a position that it is scarcely conceivable they could have been formed with the sea at its corresponding elevation if there had existed glaciation of even the same intensity as that which now obtains, to say nothing of a greater intensity. I believe I may venture to say, that in those regions the existing glaciation represents a maximum, such as has never been attained before, and if this conclusion should turn out to be sound, it is one, I need hardly say, of considerable importance from the point of view of physical as well as of biological geography.

After the reading of the Papers, the PRESIDENT said: We have present with us this evening several of our old English arctic officers, who all, I am sure, are delighted to welcome Captain Sverdrup, and I hope some of them will address the meeting.

Admiral Sir LEOPOLD M'CLINTOCK: I very gladly avail myself of this opportunity of expressing my, not merely satisfaction, but pleasure, at hearing the report of the expedition, and I desire heartily to compliment Captain Sverdrup upon the great success which has attended his efforts. His well-sustained energy for fully four years has brought about results which are of very great use to geographical knowledge. He entered a part of the arctic regions which we English people thought to be peculiarly our own. The Parry archipelago had been discovered by Sir Edward Parry. I may say a word or two before we leave the Parry archipelago: its southern side was discovered by Parry eighty-three years ago, and exactly fifty years ago the northern part was discovered by our own sledge parties when searching for Sir John Franklin. I am glad to notice that the Sverdrup methods of exploring by sledges were very similar to those we used in our own expeditions, but with this remarkable difference, that he was supplemented by dogs to draw the sledges; we had to draw our own. We looked upon that part of the arctic regions as so peculiarly our own that we spoke of it as if the Queen's writ was free to run through it even to the north pole. But we can no longer make that boast; Captain Sverdrup has been there, and he has discovered other lands farther north, so that we cannot look for any immediate increase to the British Empire in that direction. This evening must be given up altogether to geographical matters, and I heartily congratulate Captain Sverdrup on his great success and wonderful achievements, and I hope he may long live, and enjoy good health and wear his honours and distinctions.

Admiral Sir VESEY HAMILTON: I have very little to add to what Sir Leopold M'Clintock has said of the admiration in which we hold Captain Sverdrup and his followers for the way in which they performed their work. We may say of Captain Sverdrup that he is the Captain Cook of arctic expeditions. He has brought back all his men but one. They possessed advantages which we did not possess in the way of dogs; we had some, not many, but he has not described anything with regard to the difficulties of dog-driving. We once had an admiral 150 years ago, and it was said of him that "he was never known to swear, not even at sea," but he was never known to drive a dog-sledge, or he probably would have. In my earlier days we had not the advantage of being able to take photographs, and most of us were not of very big stature. But those photographs which we have seen on the screen make the members of the expedition look like giants. The work that has been done by Captain Sverdrup has my great admiration, and I cannot speak of it too highly. One thing, it shows the enormous uncertainty of ice-navigation, for, after spending two years in a harbour, there were but 5 miles of ice between them and the open sea, and but for that 5 miles of ice they would have been able to get back one year earlier. Dogs were first introduced into the arctic regions by Captain Penny, who was in charge of an expedition by the Admiralty in 1850. One curious thing about these dogs was that they were divided amongst the two ships, but the men who fed the dogs on the one ship did not dare go near the others. They are a very peculiar race are Eskimo dogs, for if anything happens to the leader of a dog-sledge, he pitches into number two, and number two pitches into number three, and so it goes on to the end. It is a curious fact that in this room at present there are arctic navigators representing various expeditions from 1847 up to the present time—fifty-five years—and if we go back a little further, we may add Sir Joseph Hooker, who accompanied Sir James Ross in 1837 in his antarctic expedition, so that we can trace back ice-navigation for sixty-five years, and I do not think there are many kinds of work that can go back so many years. I can certainly say, in the name of all arctic navigators, that we welcome Captain Sverdrup here most heartily, and congratulate him on the successful conclusion of that expedition.

The **President**: We now come to the arctic officers on the eastern side, and we will begin with Admiral Markham, who I hope will address the meeting.

Admiral A. H. **Markham**: Like my old friend, Sir Leopold M'Clintock, I am only too glad to avail myself of this opportunity of offering my congratulations personally, and I think I may also say in the name of the officers who served under Sir George Nares, our congratulations on the excellent geographical work that has been performed by Captain Sverdrup during his recent expedition in the arctic regions. We were all very much pleased and very much relieved when we heard of the safe arrival of the *Fram* last September in Norway, after having been lost sight of to the world for something over four years, and the pleasure we then felt was enhanced when we heard of the excellent work that Captain Sverdrup had done in those regions—work which displayed that spirit of endurance, that spirit of pluck, and that determination which we were well assured, from our knowledge of what Captain Sverdrup had already done in the arctic regions, he possessed. Thoroughly realizing as I do the great difficulties he had to contend with, I can all the more appreciate and admire the skill, the energy, and the perseverance which he and his gallant followers displayed in overcoming those difficulties. Sir Leopold M'Clintock has taken us back fifty and eighty years, and I can remember almost as if it were yesterday the meetings that were held in this very theatre thirty years ago—meetings at which your President of to-day was the leading and guiding spirit; meetings that were held with the object of the renewal of geographical exploration in the arctic regions. I am sorry that there is not a north circumpolar map of that date hanging in juxtaposition to the one now in front of you, so that you would be able to see at a glance the large amount of geographical work that has been performed during the period that I have referred to. What was then almost a *terra incognita*, as was shown by Captain Sverdrup just now on the screen in the region of Jones sound, has been explored, the coast-line has been delineated on your map, and now we have Captain Sverdrup coming back and giving us an account of his discoveries in a portion of that region which was a *terra incognita* in those days from Jones sound, along the west coast of Ellesmere Land, until he almost joined hands with Aldrich's farthest on the north coast of Grinnell Land. I am one of those who feel pretty sure that before many years have elapsed, such is the spirit of geographical enterprise in the present day, that we shall have a very fair knowledge of the conditions of land and ice and of sea in the polar regions. And I say polar regions in contradistinction to arctic regions, because we must not forget an expedition now in the far south that has already done good work, and we hope is continuing to do good work, under the command of Captain Scott and his brave associates in the *Discovery*, an expedition whose despatch is almost entirely due to the never-tiring energy of our President, Sir Clements Markham. There are one or two points on which I should like to ask for information, but our President has told us that Captain Sverdrup has a very limited knowledge of our language, and perhaps it would not be fair to ask him, but perhaps Mr. Schei would be able to answer one or two questions which I should like to put. We have seen some excellent illustrations from photographs on that screen. There were one or two of sledges. Sir Leopold M'Clintock told us just now that these sledges were different from those in use in his time because they were supplemented by dogs. But I saw a big wheel on the screen, and I am not quite sure of the utility of that wheel, whether it was to guide the sledge or whether it was to increase its motive power. There was another question I should like to put. I understand that Captain Sverdrup never saw anything of what we called palæocrystic ice. He alludes in his paper, in the neighbourhood of some place with a most unpronounceable name, but which our President has just told us had something to do with butter and porridge, to the fact that there was some very heavy arctic ice near this place, and I should like if Mr. Schei could tell us if he could estimate the thickness of that ice, because I have a shrewd suspicion that it was our old friend—or old enemy—of 1876, to which we gave the name of palæocrystic, on account of its very massive character. In conclusion, I should like, in the name of the officers who served under Sir George Nares, to offer to Captain Sverdrup our warmest and sincere congratulations on the great and valuable geographical results he has brought home with him from this expedition.

The PRESIDENT: That wheel was a pedometer for measuring the route, and the ice is about 30 feet thick.

Admiral ALDRICH: I am delighted to add my remarks to those of Admiral Markham in saying how sincerely I congratulate Captain Sverdrup on the success of his expedition, and not only Captain Sverdrup but all those who went with him. I think Admiral Markham has pretty well thrashed out all the points. Up here we all noticed the presence of that wheel, and the pedometer must have been a useful thing on smooth ice. I can only wish that Captain Sverdrup had completed the gap between his exploration and the one which I made under Sir George Nares. It is a very little gap, and apparently on the map it is a very simple thing to do, but I have no doubt that along that coast some of that ice which Admiral Markham calls our enemy would be met with. It is just thereabout one would expect to find it, although I think, so far as I can remember, the ice along the coast was not so heavy as it was in the neighbourhood of the north end of Smith sound; yet, as Captain Sverdrup thinks—and I think he has good reason for stating what he thinks—there is no land to the north of where he was, we may assume that for some reason or another there must be something to prevent the formation of the heavy ice on that part of the coast. One can scarcely see why it should not be along the north-west coast. That remains among other interesting items to be discovered in the future. Whether any one will ever deem it worth while to go out and look I know not, but I firmly believe in my own mind that we were put on this Earth's surface to discover as much as we can about it. And all I can say in regard to those who began and those who have continued and those who may in the future continue is, that one wishes that the same success may attend their endeavours as has attended Captain Sverdrup and his followers.

The PRESIDENT: Is there any one present who would address us on the geology of these regions?

Prof. **Garwood**: In the absence of anybody worthier, I feel it my duty to express the very great admiration I feel for the excellent work which has been done by Mr. Schei and his companions with regard to the scientific portion of the expedition, especially with regard to the geology. At this meeting I cannot go into details about what we have heard, and we have been told that only a portion of the details have been worked out. There are, however, one or two points to which I should like to allude. It is very interesting to me to hear that the geological formations mapped by Mr. Schei are very similar to those which occur in the island of Spitsbergen, and I can appreciate very much the very difficult work Mr. Schei must have had in order to collect this material. After the two holiday trips I made with Sir Martin Conway, which we made in the summer, I can appreciate the difficulties of obtaining collections of this kind. With regard to the details, there are one or two points I would like to call your attention to—one is the enormous widespread occurrence of marine rocks of upper carboniferous age. I did not quite gather whether these rocks are what are spoken of as Permo-Carboniferous, or whether they are the true carboniferous rocks of this country. On the east side of North America the former rocks do not occur, but from Spitsbergen spread right away into Russia and that part of the world. So that now we have evidence of an upper carboniferous sea occupying the present site of the Arctic ocean. Then with regard to old red sandstone formations, those occur right across from Spitsbergen, and the author mentioned many other forms and fossils of alpine marine trias with *Damella cornelli* quite different to the rocks of our own country, again proving an arctic sea at that period also. With regard to raised beaches, it is interesting to find that that part of the country shows changes of level, just like the island of Spitsbergen, Franz Josef Land, and other portions of the far north. In that connection the absence of a more extensive glaciation in the past is very interesting indeed. We have heard a great deal lately about the cause of these raised beaches. We have been told that the raised beaches are due to the melting away of the former ice-sheet which stretched further to the south than it does at the present day. Now that appears to be quite contrary to the recent observations made by the author. If the ice is now at its maximum, how do we account for the raised beaches? That is an interesting point I should be glad to hear something more about. There are many other minor details which we cannot enter into at this early stage, but I should like again to congratulate Mr. Schei on the very important work done by himself and companions in these regions.

The **President**: I have no doubt Prof. Garwood regrets the want of time in discussing these questions. The whole subject of the northern archipelago is one of deepest interest. It is a homogeneous region in itself, geologically, meteorologically, and geographically, and if Captain Sverdrup could have remained here a little longer we might have had another and fuller discussion on the whole subject of the geography of these regions. I hope that may be possible at some future time. We now have to thank the authors of the papers. It is a very great pleasure, I am sure, to the people of this country that they should be colleagues, as it were, in arctic discovery with our gallant Norwegian kinsmen. The Norsemen were the first arctic explorers on the east and west of Greenland. There are those who believe, as I am inclined to do, that the great cairns discovered on Washington Irving Island are not wholly unconnected with the discoveries of the Norsemen. If that is the case, we must feel that Captain Sverdrup and his companions, when near that island in Hayes sound, were on their own land. I do not venture to say that the round towers mentioned up Jones sound had anything to do with the Normans; but I do feel that we may rejoice in finding that the Norwegian explorers have filled up this gap which we have long wished to have filled up, more than if it had been filled by explorers from any other country. I rejoice to see those names which we used to study in the old maps now appearing as a sort of wedge between our eastern and western discoveries. It is pleasant to read these old Norse names, for the most part, I think, describing the character of the country or of the cape or the bay, instead of covering the whole map with Jones and Brown and Robinson. I was very much struck, particularly on this point, that Captain Sverdrup has suggested such excellent names, describing the character of the country and the capes and bays. Captain Sverdrup and his companions have set quite an example in the admirable way in which they have conducted their work, and the friendly tone that has existed throughout the expedition, and the way one has helped the other, and this, no doubt, is one of the reasons of their great success. I am sure now the meeting will wish me, by a unanimous vote, to express our warm thanks to Captain Sverdrup for his admirable paper and to the beautiful illustrations, and to Mr. Schei for his most interesting account of the geology of the expedition.

ADMIRALTY SURVEYS DURING THE YEAR 1902.

UNDER the orders of the Lords Commissioners of the Admiralty, eight of His Majesty's vessels, with three small hired steam-vessels, manned by 78 officers and 703 men, have been employed on hydrographical surveys on the home and foreign stations.

The following is a brief summary of the work accomplished, as detailed in the report prepared for presentation to Parliament:—

Reports of 318 rocks and shoals which were dangerous to navigation have been received at the Hydrographic Department, and were notified to the public by Notices to Mariners; 1924 miles of coast have been charted, and an area of 12,661 miles has been sounded.

In *Great Britain*, various resurveys were made—at Portsmouth and Plymouth; in Dover bay, and in the Thames estuary.

The river Yealm was surveyed, and a plan made of Wembury bay.

King road, Bristol channel, was resounded. Great changes have taken place here since the last surveys in 1880.

Loch Roag, a very fine harbour in Lewis, was resurveyed, revealing a great many new rocks.

A remarkable instance of a local magnetic focus was also found in East Loch Roag, where the compass is much deflected.

A survey of Moray firth was carried as far as Burgh head, on a scale of 4 inches to the mile.

Kingstown harbour was resounded, and considerable changes found.

In *Newfoundland*, the survey of the intricate bay of Exploits was continued, and a plan of Peter arm was also made.

In the *China seas*, two ships were at work. The surveys of the East Lamma channel and the western approach to Hong-Kong were finished.

Mirs bay survey was continued, while plans were made of Long and Crooked harbours; and the outer part of Tolo channel, left incomplete last year, was also finished.

A considerable part of the north coast of the British sphere of influence around Wei hai wei was charted, and an area of the Yellow sea was sounded.

A complete survey of the Peiho river entrance and Taku bar was made, for the purpose of planning works for the improvement of the bar.

A part of the approach to Amoy was examined, and several rocky heads discovered.

In *Australasia*, the surveys of Poverty bay and the Bay of Plenty, New Zealand, were proceeded with. A survey of Gisborne anchorage was also made.

Bramble cove, Tasmania, was charted on a scale of 6 inches to the mile.

In the Solomon islands, a running survey was made of Ysabel island, recently transferred to Great Britain by Germany, and quite unknown; plans were also made of Vulavu, Turnibilli, Maringe, and Estrella anchorages, in the same island. Extensive banks were found on the eastern side of Ysabel.

At Gavutu, a plan was made of Tulagi island, the residence of the commissioner.

In all communications with the natives of Ysabel, they were found quiet and peaceable. The Solomon islanders do not generally bear this character, but a surveying vessel, not desiring to obtain anything from the natives, raises no suspicions, forms an excellent means of opening relations with them, and tends to friendly terms being maintained.

In *British Columbia*, the main triangulation of the Vancouver island surveys was extended to Cape Commerell and Cape Caution.

Soundings over an area of 288 square miles were obtained in the approaches to the strait of Juan de Fuca.

The survey of the inner channels of Haro strait from Sydney to Active pass was completed.

Broughton strait survey was finished.

Beaver harbour was surveyed on a scale of 4 inches to the mile. While in Queen Charlotte sound a plan was finished of Narwhitti bar.

In the *Mediterranean*, the chart of Gibraltar was brought up to date, and a survey made of the east side of the rock.

A chart was made of the Gulf of Kolokithia in Greece, embracing the coast from Cape Matapan to a point a few miles short of Cape Malea, including the Cervi channel and both shores of Cerigo island as far south as the Dragonera islets.

Plans were also made of Gythion, Port Scutari, and Port Kaio.

On the *West Coast of Africa*, the survey of Old Calabar river was in progress.

The surveying ships maintained by the Indian Government made some surveys in the Persian gulf and a chart of the Chittagong river.

In Bengal, Megna river was surveyed. The Tenasserim coast was charted from Moulmein to Ye river, and on the Arakan coast a harbour known as Cox's Bazaar was surveyed.

During 1902 the Hydrographic Department has published 96 charts and plans, and 38 new plans have been added to the existing plates.

The number of charts printed to meet demands has, during the year, amounted to 522,688.

REVIEWS.

EUROPE.

OLD LONDON.

'London before the Conquest.' By W. R. Lethaby. London: Macmillan. 1902.

IN spite of the profusion of existing literature on the antiquities of London, there has hitherto been no one work which has attempted to give a comprehensive general sketch of the topography and buildings of the city in its early years. This Mr. Lethaby supplies in the present volume, which is to be welcomed as presenting to the lay reader a clear summary of the results of antiquarian research, many of which are widely scattered in the proceedings of learned bodies. The work, however, is more than a mere summary, for the author has views of his own on many disputed points, and endeavours to eliminate the mistaken views which, he holds, have gained ground of late years. Many of the conclusions of Mr. J. R. Green and Mr. Loftie are in particular criticized as quite devoid of foundation. As a rule, the author's ideas are sensible and in accordance with the balance of evidence, though the scantiness of this occasionally makes any conclusion little more than a matter of personal conviction. The style is sometimes rather fragmentary, rendering it not always easy to follow the drift of the writer's argument, but the book is none the less a useful contribution to our knowledge of London before the Conquest.

Mr. Lethaby begins with a brief discussion of the origin of London and its fortunes under the Romans and Saxons, and then treats in turn of its main topographical features—hydrography, roads and streets, walls, churches, etc. A few only of his conclusions can here be touched upon. He is throughout a consistent advocate of the antiquity, whether of the city itself or of its main features, many of which, he thinks, show a continuity of existence from very early times. He holds that London existed before the Roman occupation, and that the legends related by Geoffrey of Monmouth were based on real folk-lore, and were not pure inventions. The derivation of the name from a King Lud, though in accordance with tradition, cannot, however, be accepted without further evidence. He believes in the existence of a Christian Church in London in British days, and places the occupation by the Saxons about 570. With regard to the lines of communication, he dismisses the idea of a ford at Westminster as a pure myth, showing that the memory of the former ferry at this part survives in Horseferry Road. The great north and south Erming Street, not referred to in the Antonine Itinerary, was, he concludes, the work of late Roman times. The west to east road, which followed the present course of Oxford Street, passed through the City and by the Mile End Road through Stratford, and did not, as has been held, take a more northerly course by Old Street. The original London Bridge was but little to the east of the existing structure, and its continuation north coincided exactly with the modern Gracechurch Street. Much interesting information is also given respecting the citadel, the quays, the churches, "London Stone," and many other details into which limits of space forbid us to enter.

EUROPE IN THE SIXTEENTH CENTURY.

'Shakespeare's Europe. Unpublished Chapters of Fynes Moryson's Itinerary.' By Charles Hughes. London: Sherratt and Hughes. 1903.

The well-known 'Itinerary' of Fynes Moryson, in which that acute observer set down the personal narrative of his travels through the greater part of Europe, does not represent the whole literary activity of its writer. After the publication of the Itinerary in 1617, Moryson set to work on a more systematic account of the various European countries, which was to set forth in outline the history, existing state, religion, manners and customs, etc., of the several states. The work seems to have been completed by 1619 or 1620; but though its author obtained the licence for its publication in 1626 from the then head of the State Paper Office, Sir Thomas Wilson, he for some reason or other never carried out his intention, and the work has remained in manuscript to the present day. At an unknown date it became the property of Corpus Christi College, Oxford, where it was lately examined by Mr. Charles Hughes, its present editor, who has done good service by making generally accessible such an interesting memorial of the state of Europe at the close of the sixteenth century. The manuscript is in three handwritings, one being that of Moryson himself, the others those of assistants. Its substance is somewhat unequal in character, being in part made up of Moryson's own observations, in part a compilation. In view of the great length of the manuscript, which would, if printed in full, have occupied some 1200 pages, Mr. Hughes has probably exercised a wise discretion in omitting much of the compiled information, the value of the work lying principally in the shrewd personal observations of the writer on the men and manners of his time, in which respect the insight given is extremely valuable, if not unique. The careful account of Germany as it was in Moryson's day is perhaps the most valuable section, but the survey practically includes the whole of Europe, except Spain and Russia. The editor is careful to indicate where omissions occur, and his brief outlines of the subjects of the omitted sections will be useful to those who may be inclined to go to the original for further information. The work is produced in excellent style, and contains a sketch of Moryson's career, as well as photographic reproductions of pages of the Itinerary and its supplement.

ASIA.

FRENCH INDO-CHINA.

'Mission Pavie, Indo-Chine, 1879-1895. Géographie et Voyages, IV. Voyages au Centre de l'Annam et du Laos, et dans les régions sauvages de l'est de l'Indo-Chine.' Par le Capitaine de Malglaive et par le Capitaine Rivière. Ditto, V. 'Voyage dans le Haut Laos et sur les Frontières de Chine et de Birmanie.' Par Pierre Lefèvre-Pontalis. Paris: Leroux. 1902.

The monumental work which records the results of the untiring labours of M. Pavie and his coadjutors for the elucidation of the geography and ethnology of French Indo-China is brought a stage nearer completion by the issue of these two volumes, which contain the reports of three of the officers on M. Pavie's staff, each preceded by an introduction from the hand of their chief. As was the case with former volumes, they embody a large amount of valuable material on some of the least-known parts of the Indo-Chinese peninsula, and are interspersed with carefully compiled maps, which will form an indispensable basis for the mapping of these countries. The report of Captain de Malglaive, which occupies the greater part of vol. iv. of the work, describes an important series of explorations carried out in 1890 and 1891, mainly with the object of elucidating the best lines of communication between the coast of Central Annam and the Mekong, across the difficult country of mountains and plateaus partly explored in the seventies by M. Harmand. During these journeys, the main results of which are summarized by M. Pavie on p. xxiii. of his introduction, he had five times crossed the water-parting, four times carried a line of survey between the Mekong and the ocean, and discovered the ideal route into the heart of the country by the passage of Ai-Lao. His work also threw new light on the ethnographic relations of this region. The last part of the same volume is occupied by brief reports by Captain Rivière, an officer of much promise, who unfortunately succumbed to the effects of the climate before completing his work, so that the complete memoirs which he would otherwise have prepared are not available. In 1890-1891, Captain Rivière had done good work in the upper Mekong basin, especially in the Tran-ninh district, south-east of Luang Prabang, and in 1894 he was attached to the mission for the examination of the upper Mekong region in conjunction with the English party under Sir J. G. Scott. He was a careful observer, and during the course of this expedition, on which he contracted his fatal illness, he had made some important astronomical determinations of position, while throughout his journeys he took many excellent photographs, which have been used to illustrate the various volumes of the series.

The fifth volume of the geographical memoirs is occupied by the reports of M. Lefèvre-Pontalis, a young civilian attached to the "Ministère des Affaires l'étrangères," who, when a student at the "École des Langues Orientales," had already been attracted to the study of French Indo-China by a chance meeting with M. Pavie. Eventually appointed to the staff of the mission, he was for a time personally attached to M. Pavie himself, keeping the record of his journeys and closely associated in all his work. He was afterwards entrusted with independent work, for which his enthusiastic study of the geography of French Indo-China had pre-eminently fitted him, and the results of his labours, which include important observations on the populations and economic possibilities of the regions traversed, are given in the present volume. His earlier journeys were principally concerned, like those of Captain Rivière, with the upper Laos region, while, like that officer, he took part in the Anglo-French frontier commission of 1894, exploring the middle valley of the Nam Hu in conjunction with Lieut. Thomassin and Dr. Lefèvre.

AFRICA.

MAP OF THE MARCHAND EXPEDITION ACROSS AFRICA.

'Mission Marchand. Haut-Oubangui—Bahr el Ghazel—Nil-Ethiopie-Djibouti Carte publiée sous les auspices de la Société de Géographie de Paris. Dressée et dessinée par le Commandant Baratier d'après les travaux topographiques et astronomiques des Officiers de la Mission Marchand et d'après les itineraires des Officiers du Haut-Oubangui, de M. Faivre (Expédition du Dedjaz Thessama), de la Mission Bonchamps, de la Mission Bòttego, et des anciens voyageurs.' Scale 1 : 1,000,000 or 15·7 stat. miles to an inch. 4 sheets. Paris: Henry Barrère. 1903.

All the maps, showing the route of Commandant Marchand's expedition across Africa, that have appeared so far have been mere sketches, and a final map, giving the complete geographical results of the journey, has, for some reason, been delayed longer than might have been anticipated. However, we have at last, published under the auspices of the Société de Géographie of Paris, the complete map of the expedition, combined with the work of other explorers. This consists of four sheets, each measuring about 3 × 2¼ feet, and is drawn on the scale of 1 : 1,000,000. It includes all the more important part of the journey from the Ubangi river through the Bahr-el-Ghazal region to the White Nile, thence east through Abyssinia *viâ* Addis Ababa and Harrar to Jibuti. In addition to the route of the Marchand expedition, an attempt has been made to show the routes and geographical results of other explorers through the same region, and those of the Bonchamps, Faivre, and Bòttego missions are laid down, as well as recent explorations of French officers in the upper Ubangi. But the map cannot be taken as representing the present state of our knowledge of this part of Africa, for in several districts it is surprisingly incomplete and out of date, and districts which are now fairly well known are shown as almost unexplored. For instance, in the region to the north-east of Lake Stefanie and the chain of lakes as far as Lake Zwai and the upper valley of the Hawash, the important work by a most competent surveyor who accompanied Mr. J. J. Harrison's expeditions in 1899–1900 seems to have been entirely overlooked, as well as that of other explorers in the same district. Then, again, the surveys of the expedition under Major Austin from the Sobat to Lake Rudolf have not been utilized, and the country through which he passed from the upper Akobo to the north-west end of the lake is shown as unexplored, although it is clearly laid down in the map published in the *Geographical Journal* for June, 1902. Major Gwynn's careful survey work has also been apparently overlooked. Other similar cases might be pointed out, and it is to be regretted that better use was not made of the available cartographical material for this region.

As regards the route of the Marchand expedition, in many parts the country traversed was more or less known before, but a great deal of detailed information has been added, and positions of places which were only approximately laid down have been more accurately determined. It would have been a great advantage, and saved further trouble and consulting reports, if a table giving particulars of the astronomical observations taken had been printed upon the map itself, for which there is ample space. The position of some important places as determined by the Marchand expedition differs from those hitherto accepted. For instance, Fashoda is moved in longitude about twenty-three minutes to the west of the position laid down on the War Office map as the result of careful observations, and which certainly cannot be in error by anything like this amount. Other places, which have been fairly accurately fixed for some time past, are here altered considerably. The map is clearly printed in colours, and shows the principal routes in red, hills chalked in brown, and water blue. A plan of Fashoda is given as an inset.

MATHEMATICAL AND PHYSICAL GEOGRAPHY.

English and Irish Climates.

'The Climates and Baths of Great Britain and Ireland, being the Report of a Committee of the Royal Medical and Chirurgical Society of London.' Vol. i. The Climates of the South of England, and the chief Medicinal Springs of Great Britain. Vol. ii. The Climates of London and of the Central and Northern Portions of England, together with those of Wales and of Ireland. London: Macmillan & Co., Ltd. 1895, 1902.

Unfortunately, these important volumes deal only with the larger part, not the whole, of the British Isles, for, as is stated in the preface to the second volume, "the Climates of Scotland have been omitted, as the committee failed to secure the necessary local co-operation." The necessary local co-operation, however, was obtained elsewhere in full measure, and the various localities are described by the authorities best fitted for the task.

To a considerable extent, the volumes may be looked upon as a manual of medical geography for the southern parts of the British Isles. The standing of the authors secures that there is no "booming" of particular health-resorts, and the statistics of climate, which are compiled mainly from the published summaries of the Royal Meteorological Society, are of great value as a basis of comparison. Besides climate, the subjects dealt with are mainly the mineral wells, water-supply, drainage, and the prevailing diseases of the locality; but some authors go considerably beyond this. Particular reference may be made to Sir John Moore's description of Ireland, which, besides being the longest article in the series (it comprises two hundred pages), is in some ways one of the best geographical accounts of the island with which we are acquainted.

It is natural that different authors should handle the available climatic statistics with varying degrees of skill, and the data themselves vary greatly in their completeness and trustworthiness. The description of South Wales by Dr. Theodore Williams in vol. ii. may be taken as an example of the best way of marshalling the available facts.

Medical men, being trained to careful observation and reasoned deduction, could not fail to notice how much the configuration of a district affects its climate and healthfulness. Examples could be culled from every article, but we are content to quote one from Dr. W. M. Ord's Introductory Remarks on the Climate of the South of England in vol. i., because it is a general statement, and refers to a comparatively uniform feature—the coast-line.

"As an outcome of this frequent change of substance in the seashore follows the remarkable variety in the outline of the coast already mentioned. This is, indeed, much more than a mere variety of outline; it consists also in rapidly succeeding diversities in the elevation of the projections and recessions, so that in a coast which looks in the main southward a rich series of contrasts of aspect is obtained. Where a ridge comes down from high inland into the sea, its shelving sides are found to embrace great differences of climate within a small area. We may find one side of a bay exposed to east winds, with an air which is found to be tonic and bracing, while on the other side, with a westerly or south-westerly aspect, the sun pours in on a beach lying at the foot of high cliffs with almost tropical warmth; and one side of a headland may be so warm as to be held to be relaxing, while the other is cool and invigorating."

The article on the Climate of London, by Dr. W. Ewart, presents many points of special interest, bearing particularly on the changes in natural conditions due to artificial circumstances. The dryness of the soil under London produced by the constant drawing away of the underground water, and the covering of so large an area of streets with an absolutely impervious paving, is credited with a considerable share in the healthiness of the town. The progressive desiccation of the soil and the increasing stringency of regulations against the emission of smoke are assigned as reasons for the gradual diminution in the number and intensity of the fogs.

It is difficult to give a fair idea of a book which has many of the advantages and defects of an encyclopædia; but that the book is valuable and a credit to the society which has produced it is, we think, made evident by the few instances we have been able to cite.

General Climatology.

'Handbook of Climatology.' By Dr. Julius Hann. Part i. General Climatology. Translated by Robert de Courcy Ward. New York: The Macmillan Company; London: Macmillan & Co., Ltd. 1903.

Hann's 'Climatologie,' in its latest three-volume edition, has taken its place as the acknowledged authority on the subject, and it would be difficult to imagine that the work could be superseded or displaced in the present generation.

In the United States, climatology, which may be called geographical meteorology, is systematically studied in universities and colleges, and Prof. Ward is charged with the subject at Harvard. With the immediate object of supplying his students with a satisfactory text-book and the wider purpose of affording the English-reading public an opportunity of becoming acquainted with Hann's work, he resolved to make the translation which is now before us. Any one who glances at the pages crammed with statistics of the second part of the original book, Special Climatology, will understand why Prof. Ward resolved to limit his labours to the translation of Part i., General Climatology. This part makes a very substantial volume, and it is admirably translated; the only real improvement that we could suggest would be a liberal supply of diagrammatic illustrations. Prof. Ward has brought the divisions and subdivisions of the text into a form which appeals more to the English reader than that which is adopted in the original, and there are certain additions, chiefly in the way of American instances, which counterbalance certain omissions of Central European details.

While in general the references to recent publications are copious and up to date, we miss Dr. Herbertson's important paper on the distribution of rainfall over the land, which is certainly a contribution to climatology as distinct from meteorology. We should have liked—and we say it even at the risk of being considered insular—a somewhat fuller citation of illustrative instances from our British climates; for, like our weather, they comprise a considerable range of samples.

The book has been very carefully revised, and we have noticed remarkably few slips; perhaps the most serious is the ominous inclusion of Peking in a table headed "Evaporation and Rainfall *in Russia.*" The curious spelling *Enisseysk* occurs in one place, although *Yeniseisk* is given elsewhere. To take yet another example from Russia, we find *Kaschkar* decidedly unfamiliar; it is obviously intended for *Kashgar*. Since, however, the book deals, not with special climates, but merely with the general principles of climatology, uniformity in transliteration is not of essential importance.

The book is divided into two parts—(i.) The Climatic Factors, such as temperature, moisture, wind; (ii.) Solar Climate and the chief varieties of Physical Climate, which in turn is subdivided into three sections. There are—(1) Solar or Mathematic Climate, *i.e.* the theoretical climate zones of a sphere with homogeneous surface; (2) Physical Climate, including continental, marine, and mountain climates, the last being dealt with in a particularly full and interesting way; and (3) Changes of Climate. The last section discourses of the geological and secular changes of climate which have unquestionably occurred, and it also deals with periodic changes. Sunspot and lunar cycles of climatic change are neither strongly affirmed nor wholly denied, but on the whole the various theories are branded with "faint praise." Brückner's cycle of thirty-five years is more cordially received because it has been inductively arrived at from climatic facts, while most of the others have been deduced from the laws affecting the assumed controlling causes.

The metric system and Centigrade scale are used throughout, and very full reduction tables are supplied for their conversion to our more familiar units. We note with some surprise that the translator has thought it necessary to give Fahrenheit equivalents to one-hundredth of a degree when the Centigrade values are only to one-tenth. As a tenth of a degree Fahrenheit has practically no meteorological and still less climatological importance, the nearest tenth would certainly have left an ample margin of safety.

Prof. Ward deserves the hearty thanks of geographers, as well as of meteorologists, for placing this invaluable treatise in the hands of English-speaking students.

H. R. M.

GENERAL.

ENCYCLOPÆDIA BRITANNICA.

'The New Volumes of the Encyclopædia Britannica.' 9 vols. text, index vol., and vol. of maps. London: A. & C. Black, and the *Times*. 1902–1903.

The supplement to the 9th edition of the Encyclopædia Britannica, brought out under the auspices of the *Times*, is now complete, and it may be of interest to glance briefly at those portions of the work which deal with geography and allied subjects. A casual inspection of the volumes is sufficient to show that among the many branches of knowledge of which the latest developments are here discussed and summarized, a decidedly large proportion has a bearing on geography in one or other of its aspects. Not only are the original articles of the 9th edition supplemented by a statement of the changes which have taken place during the last quarter of a century, but many places are to be met with in the alphabetical arrangement, which were not treated of at all, independently, in the former work.

As regards the general method adopted, it was no doubt impossible, in a work of such magnitude, in which so many different writers have taken part, to secure complete uniformity, the special character of the work as an annex to an older publication rendering it particularly difficult to adhere to a definite plan throughout. Thus, while some of the writers have held to the original intention of making the new material merely complementary to the old, others have worked on more independent lines, with the result that their articles possess greater unity, though at the cost of a certain amount of repetition of the information already given in the 9th edition.

Differences in the treatment of the several subjects naturally arise from other reasons. In the case of the older and more settled countries, the chief attention is necessarily devoted rather to the recent political developments and changes in statistical data, than to more purely geographical aspects, except in the cases where the writer of the article, by his recognized standing as a geographer, has been competent to construct his work on the scientific basis demanded by modern geographical notions. The rarity of such cases, of which the most striking examples are perhaps Prof. Davis's admirable treatment of the geography of the United States and North America, the late Dr. George Dawson's of Canada, and Prince Kropotkin's of the various divisions of Russian Asia, brings out once more the imperfect training which even our recognized authorities possess in the principles of scientific, physical, geography, which ought properly to underly a right understanding of the human side of the subject. It is under the more recently developed branches of physical geography—oceanography, limnology, seismology, and the like—hardly recognized as independent subjects of study when the 9th edition appeared, that we find some of the articles of most scientific value. The first two are admirably treated from a general point of view by Dr. H. R. Mill, the third by Prof. Milne; while Mr. H. N. Dickson's series of articles on the individual oceans are excellent summaries of the results of recent research in each. Dr. Mill's article under the heading "Geography," which contains a useful sketch of the development of geographical theory as well as of the course of modern discovery, should also be mentioned here, as well as those describing such special physical features as the Alps (from the competent pen of Prof. Bonney), the Pyrenees, and the Himalayas.

The volumes contain, however, a vast amount of valuable information on the descriptive and statistical sides of the subject, especially as regards those continents and countries which have been first brought into special prominence within the last twenty-five years. The various portions of the British Empire are very fully dealt with, in many cases by men who have themselves taken part in the important events of which they have recently been the theatre. Sir Thomas Holdich, Sir Harry Johnston, Sir Frederick Lugard, and Sir J. G. Scott are only a few of the writers who come under this category. Africa, in its general, physical, ethnological, political, and economic aspects is the subject of an article which runs to thirty-eight pages, and its major physical features are described under their individual headings; while the recent advance in the survey and exploration of Asia, South America, and the Polar Regions is also dealt with fully. Of special countries on which attention has been focussed of late, Egypt is perhaps as thoroughly treated as any, the article (by various contributors), in which is recorded the striking advance made by that country under British tutelage, running to no less than thirty-three pages.

The articles dealing with the countries of Europe are, as already remarked, largely statistical in character, but their value in a work of reference by no means suffers from this, and, being all written by competent authorities, may be taken as thoroughly trustworthy at the time of writing, though owing to delay in publication some of the facts have since become out of date. In some cases (*e.g.* in that of Bulgaria, to which fourteen pages are devoted) the physical geography meets with more attention than in most, though, as before remarked, this is certainly not, broadly speaking, the strong side of the geographical articles. Lastly, mention should be made of the excellent index, which embraces the original as well as the supplementary volumes, and though a marvel of compression, does not suffer from this from the point of view of practical utility.

In the editions of the work previous to the supplement excellent maps by British cartographers were published with the articles themselves, and for purposes of handy reference this was certainly a convenient arrangement; but the publishers have now issued, as one of the new supplementary volumes, a general atlas, of 124 maps, and an index to about 250,000 place-names, constituting volume xxxiv. of the complete work. Many of the maps contain a great deal of information, and are especially full of names of places—a useful feature, while the copious index is most serviceable.

The maps in this atlas are of American origin, being published by the American Century Co. Out of a total number of 124, which the atlas contains, 52 are devoted to the United States, 13 to the British Isles, and fewer to some of the important continental countries.

The maps are printed in colours: hills brown, seas blue, railway lines red. Other colours are employed to show boundaries. The hill shading, which is in vertical hachures, is often very confused, and on some of the maps the confusion is considerably increased by place-names, which are often not only overcrowded, but badly written and awkwardly spaced. There are some remarkable instances of the lack of proper supervision in the spelling of place-names, such as that of Sheringham in Norfolk, which is given both as "Sheringham" and "Sherington" on one map, and "Sherringham" on another. The registration of the various colour stones is often unsatisfactory, and in some cases, such as that of the map of Northern India (No. 41), this leads to confusion both in boundaries and railways. No. 3 is a useful travel map of Central Europe, although on a small scale, and shows railways, steamship lines, and Alpine roads; but such an important route as that to the Hook of Holland from Harwich is not indicated.

On several of the maps red spots appear, and a note explains that these indicate "volcanoes active during the nineteenth century;" but in the map of Central Africa, the only really active volcano in that continent is not indicated. On the same map, the Uganda railway is shown as passing far to the north of the line it actually takes on approaching Victoria Nyanza. This northerly route, although originally surveyed, was subsequently changed to the southerly and shorter one. As might be expected, the maps of the United States are the most useful and satisfactory, being drawn on fairly large scales, and containing a large amount of information. It should be stated that in some cases the atlas is supplemented by black and white maps in the text.

THE MONTHLY RECORD.

EUROPE.

The Age of the Swiss Lake-basins.—At the meeting of the Geological Society of London on April 29 of the present year, Dr. Preller read a paper on "The Age of the Principal Lake-basins between the Jura and the Alps," being the sequel to a paper read last year, in which the same author had shown that the principal Swiss lake-basins could not have existed during or immediately after the first or Pliocene glaciation of the Alps, but had not dealt with the question of the particular period of their formation. Considering first the case of the Zürich lake-valley, he now shows that the deep-level gravel beds in the Limmat valley near and below Zürich are essentially fluviatile, similar to the gravel carried by the river Sihl at the present day. They rest upon glacial clay of the second glaciation, and are overlaid by the moraine bars and secondary products of the third glaciation, which are in turn overlaid by, and mixed with, the post-glacial alluvia of the Sihl. The author therefore holds that they were deposited by a river during the second inter-glacial period; that the lowering of the valley floor was initiated in the course of the third glaciation, probably when the glacier had already reached its maximum extension; that the zonal subsidence continued throughout the retreat of the ice; and that the simultaneous formation of the lake-basin should therefore be assigned to the end of the glacial period, after which the original basin was restricted to its present dimensions by post-glacial alluvia. The same arguments were also shown to apply, in the main, to the origin and age of the other principal zonal lake-basins, the position and depth of which, it is held, point to the probability that the bending took place along several more or less parallel lines within the zone between the Alps and the Jura; that it was by no means of uniform depth; and that the Alps did not therefore subside as a rigid mass, but that the zonal bending along their edge merely extended locally for some distance from the deepest points of the lake-basins along the floors of the principal Alpine river-valleys. In support of the above conclusions, which met with general acceptance in the discussion following the paper, the author also pointed to the difficulty in the way of believing that glaciers could ever fill such extensive basins as those of the principal Alpine lakes.

Settlements on the Lower Moselle.—Dr. W. Ademeit has contributed to the *Forschungen zur deutschen Landes- und Volkskunde*, Bd. 14, Heft 4, an essay on settlements in the country lying on the left bank of the Moselle above Reil, in the Wittlich hollow, and the Trèves valley. He describes the configuration of the district, its geology, climate, and soil, and sketches its general history. The influence of the river as a means of communication in early times is shown by the Keltic place-names, which constitute 65 per cent. of the whole. They occur in great numbers along the river and the lower valleys of its tributaries. The Roman names probably belong to the sixth to eighth centuries, as they are derived from a late form of Latin. Their concentration in the Moselle valley seems to indicate that they are connected with the introduction of viticulture by the Romans. German names are less common, not because the immigrants were few, but because they occupied old Keltic settlements. Those of the earlier period end in *heim* and *ingen*, while those of a later immigration and of various forms are almost confined to the Wittlich hollow, indicating an extension of cultivation. Dr. Ademeit points out that in the Trèves valley the settlements were generally at a distance from the river protected by the terraces from floods. Schweich, situated half a mile from the Moselle, where the alluvium of the river meets the diluvium of the Wittlich hollow, owes its importance to the road from Trèves to Coblentz, which, after crossing the river, passes through the town. Riol lies on a semicircular flat which was formerly an island, and, like most other villages occupied in viticulture, was formerly in the possession of a monastery. The peninsulas attracted settlers, not only because their terraces afforded suitable ground for cultivation, but still more because their isolated situation afforded protection. On the right bank, where the mountains fall more steeply to the peninsulas, the villages have all Keltic names except Detzem (*ad decimum lapidem*).

Samland and its Inhabitants.—Dr. R. Jankowsky has treated fully the geography, etc., of this district in a thesis written for the diploma of doctor at the University of Königsberg. Samland has an area of somewhat less than 800 square miles, and is bounded by the Baltic, the Kurisches and Frisches Haff, and the rivers Pregel and Deime. It is a land of ground moraines, and owes its form to the glacial period. The higher summits, however, are built up of northern sand. Erratic blocks are scattered about in large numbers, especially in the western part. The depth of the diluvial covering is very variable, being thinnest in the hilly north-west, where the brooks have in some places cut their way down to the underlying Tertiary deposits. These, too, have been raised as high as 65 feet above sea-level, and even the lower beds, among them the blue earth containing amber, rise in some points above the water. East Samland has a slight fall, and the defective drainage has needed artificial regulation. The west coast is high, and between Brüsterort and the mouth of the Pregel extends the only continuous elevation, the Alkgebirge, which culminates in the Galtgruben at a height of 330 feet. The Prussians, closely allied to the Lithuanians and Letts, drove out the German inhabitants during the great migrations before the present era, but in the fourteenth century Prussians and Germans were about equally numerous in Samland. In later times immigrants from Great Britain, France, and other countries flocked to Samland, and in 1706 was founded in Königsberg the "Brüderschaft hochlöblicher Grossbritannischer Nation," which existed till 1800. Now all differences of nationality have disappeared. Sixty-five per cent. of the inhabitants are engaged in agriculture, growing cereals, beet-root, and fruit, and a large part of the land is laid down with grass. Fishing affords occupation to many, especially in the Haffs, where fish are plentiful; and the collection of amber from the Haffs and a mine near Sassau has during the past twenty-five years yielded about £37,500 annually to the revenue. Königsberg, on the Pregel, and the junction of thirteen lines of railway, is an important strategical point as well as a commercial centre. Its most flourishing period was 1873–78, when the most important lines into Russia had been opened, and before the export of corn from the Russian ports was fostered by preferential tariffs.

The North-eastern Moorlands of Mecklenburg.—Dr. A. Kaestner has fully investigated the Rostock, Gelbensand and Ribnitz heaths and Fischland, covering an area of about 33,000 acres near the coast of Mecklenburg. The surface of this district, with the exception of small isolated areas of boulder clay, is covered with sand, which was laid down in a lake when the inland ice was melting away. The thickness of the sand varies from 22 to 23 feet. It stands highest in the south-east, and thence falls more or less regularly to the coast, where it partly sinks under the surface of the sea, and it fills a shallow hollow in the boulder clay which underlies it in all parts. The margins of the sand region have also a regular fall from the south-western corner, and the stones strewn along them are bank deposits of a lake of glacier water. This fall may be explained by an unequal sinking of the coast region. The total absence of terraces indicates that the Mecklenburg-Pommeranian lake did not retire backwards. The sand of the north-western heath of Mecklenburg differs from that of the south-western in being of finer grain, but its proportion of heavy minerals with a specific gravity of over 2·872 (s. g. of dolomite) is about the same. Dunes are less extensive than in the south-west.—*Mitt. aus der Grossherz. Mecklenburg. geol. Landesanstalt*, xiii.

The Austrian Peat-moors.—An interesting account of the peat-moors of Austria is given by Dr. W. Bersch in the *Deutsche Rundschau für Geographie* (February, 1903). The writer begins by discussing the conditions necessary for the growth of peat—the presence of the special plants of which it is composed, of a suitable sub-soil, and of water, which prevents decomposition by screening the plants from the action of the air. Climate also has to be reckoned with, in so far as peat is only a product of temperate regions. According to minor variations in the conditions, the moors are divided into two main classes, high-level and low-level moors, these terms expressing not so much difference in absolute altitude, as of altitude relatively to the water-stratum. Dr. Bersch laments the absence of precise knowledge with respect to the peat-moors of Austria, which, except in Salzburg and Bohemia, have not been studied as they deserve to be, considering their economic importance. The country may, however, be put down as well provided with them, as they are widely distributed through the several provinces. In Vorarlberg and Tirol they are well represented, largely in the form of low-level moors, which in places, especially in the Adige valley, lend themselves well to exploitation for agricultural purposes, though the abundance of mineral ingredients renders the peat less suitable for fuel. In the other Alpine provinces high-level moors predominate, Salzburg showing a particularly large area, and doing much to exploit the moors both for fuel and peat-litter. Carinthia possesses the largest continuous moor in that of Laibach, which might be turned into good pasture-land, were not the inhabitants too poor to take the necessary steps to check the periodic floods. Bohemia, the moors of which have been the object of thorough investigation by Prof. Sitensky, is reckoned to possess an area of from 25,000 to 30,000 hectares of moorland. The well-known watering-places of Bohemia owe their existence to the abundance of mineral constituents in the moors. Galicia, with its network of rivers traversing an extensive plain, is formed by nature to be a moorland country, but more has been done here than in any other part of the empire to develop the moors in an agricultural direction, the methods adopted being thoroughly scientific and systematic. The abundance of poor and sandy soils in Galicia has been of some influence in directing attention to the utilization of the moors.

The Lakes of the Hohe Tatra.—The Hohe Tatra is remarkable for the number of its high-level lakes; no less than one hundred and seven are found between the elevations of 4000 and 7000 feet. The best known of the small lakes is the "Meerauge," the possession of which has recently been a subject of controversy between Austria (Galicia) and Hungary. According to Prof. Partsch, about half the lakes are true rock basins in the upper parts of the valleys; a number of others are morainic lakes. Their formation corresponds to the time of the ice-period glaciation of the Tatra. Grissinger's work in the Hohe Tatra (*Geo. Jour.*, Sept. 1893, pp. 255–258) included only isolated observations of depths and temperatures in the lakes: the new survey of the group by the Militärgeographische Institute in Vienna, employing photo-grammetric methods in the mountains, shows the positions and outlines of all the lakes on the large-scale map (1 : 25,000). Dr. Wilhelm Halbfass is about to carry out a systematic investigation of the lakes during this summer. The forms of their basins will be ascertained by a close network of soundings, and all the observations approved in modern limnology will be made. As the lakes are often enclosed on three sides by rock walls, with one side open and exposed in different directions, exceptional opportunities will be afforded for discussing the influence of mountain "shading" on temperature and fauna.

ASIA.

The Great Wall of China.—Mr. C. E. D. Black, who, when in China, examined personally a section of the Great Wall to the north of Shan-hai-kwan, contributes to the January number of the *Calcutta Review* a description of the wall (preceded by some notes on its history), based on the accounts of the various travellers who have touched it at some point or other of its lengthy course. It is useful to have the available information thus brought together, as few travellers have done more than describe the portion known to themselves personally, and the accounts are therefore somewhat fragmentary. Mr. Black, who, like other travellers, has found much to impress the imagination in the Great Wall even as it exists at the present day, considers that its practical utility in the days in which it was constructed has been unduly depreciated by some writers.

New Vegetation on Krakatao.—In *Nature* of March 26 last, Mr. W. Botting Hemsley gave a short note, based on an article by Dr. Penzig in the *Annales du Jardin Botanique de Buitenzorg*, on the vegetation which has sprung up on Krakatao since the great eruption of 1883. The beginnings of a new vegetation were visible at the time of the visit of Dr. Treub, some three years after the eruption, when the surface of the pumice-stone, lava, and ash was found to be covered with a slimy layer formed by microscopic *algæ*, which, by their decomposing action, created a suitable substratum for ferns, of which a dozen species were already abundant; while a few individuals of fifteen species of flowering plants, most of which had sprung from drift-seeds, were also observed. Dr. Penzig's paper gives the results of the investigations of a party of botanists who visited the island in 1897. They show that sixty-two species of vascular plants were then observed on Krakatao and the two neighbouring islets, no fewer than fifty being flowering plants. Of the latter, the seeds of 7·54 per cent. were possibly carried by birds, 32·07 per cent. were probably wind-borne, and 60·39 per cent. were almost certainly cast up by the sea-waves. Strangely enough, no additional species of fern seems to have established itself between 1886 and 1897. The strand belt is naturally the most abundant in species, and, after passing this, dense thickets of Phragmites, Saccharum and Gymnothrix were encountered, the interior and higher parts being less covered with vegetation, ferns here preponderating. Apart from ferns, the species most probably wind-borne include eight composites, six grasses, and four orchids, one of the last-named being conspicuous and relatively frequent among the flowering plants. As Mr. Hemsley remarks, it is an interesting question how far these facts throw light on the origin of the vegetation of much more remote islands, Krakatao being only 20 miles distant from Java and Sumatra.

AFRICA.

The Anglo-Egyptian Sudan in 1902.—Lord Cromer's recently issued report for 1902, on Egypt and the Sudan, gives, on the whole, a hopeful view of the prospects of the latter, and the progress made towards its development since the overthrow of the Dervishes. On his last (third) visit to the Sudan, Lord Cromer saw reason to think, not only that the country had begun to move, but that it was moving even more rapidly than could have been expected. The prime requisite is the outlay of capital on a large scale, especially for the improvement of the present very defective means of communication; and, though it is not easy at first sight to imagine from whence it can be forthcoming, the hope is expressed that money in fairly adequate quantities may in course of time be provided by the Egyptian Exchequer, without adding to the taxation at present in force. The first object to which such capital must be devoted is the Suakim-Berber railway, which is regarded as absolutely essential to the well-being of the Sudan. Further developments may be afterwards desirable, especially in the way of improving the means of access to Kassala, El Obeid, and the Ghezireh, or country between the Blue and White Niles. These must take the precedence of any scheme for a railway to Uganda, the necessity or practicability of which has yet to be shown. Telegraphic communication may in time be extended to Gondokoro,* in Uganda territory, though extension in other directions is possibly more required. River transport has already been considerably developed under the direction Mr. Bond, R.N., steamers now communicating monthly with Gondokoro and Meshra-er-Rek (or Wau), with Goz Abu Guma weekly, and with Roseires fortnightly, so long as the Blue Nile is open to navigation. The number of sailing boats south of Khartum is increasing, and a few steamers and steam-barges have been placed on the Blue and White Niles by an English company. Good progress has been made with the surveys under Colonel Talbot's direction, and Mr. Brown has sent in an exhaustive report on the Sudan forests, from which it appears that steps are urgently needed to prevent the forest fires now so prevalent. The prospects of a rubber supply from the southern provinces are good. The possibilities of cotton-growing are dealt with in a separate report, but the construction of the Berber railway must precede any definite measures to this end. Of the individual reports of the Mudirs on their several provinces, that by Colonel Sparkes on the Bahr-el-Ghazal gives valuable information on the present relations of the native tribes, etc. Owing to the constant raids of the Dinkas in the north and the Niam-Niams in the south, the smaller tribes have been broken up, and their country is now an uninhabited wilderness. Those living with the Dinkas (virtually as slaves) are, however, reassembling in the vicinity of the Government posts, and as they are far more useful members of society than the Dinkas, this is an advantage. They supply most of the grain, and all the available carriers, labourers, etc. The Dinkas have accepted the Government as a necessary evil, but the Niam-Niams are well-disposed and progressive. Colonel Sparkes thinks that if they could be induced to become owners of flocks and herds, cannibalism would die out among them. The number of the Dinkas is put down as half a million at most, and that of the smaller tribes at 100,000 all told. Malarial fever is very prevalent, and Europeans are especially liable to the black-water type.

Agriculture in British East Africa.—Mr. A. Whyte, the well-known head of the Botanical Department in the Uganda Protectorate, was lately entrusted with a mission in the coast-lands of British East Africa, with a view to examining and reporting on their agricultural capabilities. His report, handed in in January last, has since been presented to Parliament, and includes a narrative of the journeys undertaken in pursuance of his commission, and a summary of the main conclusions at which he has arrived. They agree in the main with those put forward by Mr. W. A. Fitzgerald in his work on the East African coast-lands, to which reference is made by Mr. Whyte for detailed information on the agricultural experiments so far made. Mr. Whyte regards the coast of East Africa between the Equator and 4½° S. as comparable in many ways to Ceylon, and thinks that this analogy may help to a conclusion as to the agricultural capabilities of the former. The coco-nut palm finds an equally congenial home on the coasts of both countries, and in view of the slight probability of the supply exceeding the demand, he looks forward to the creation on the East African coast of a vast forest of palms as productive and profitable as they have proved in Ceylon. Other products, cultivated in conjunction, might pay the expenses of weeding, while, by means of a cheap central tramway, the produce could be conveyed to the various bays, rivers, and lagoons for shipment. Rubber, Mr. Whyte thinks, will rank next as the most suitable and profitable product. The *Landolphia Kirkii* is very generally distributed in the forests, and its growth could be increased to any extent by cultivation; while the large tracts of strong black soil in the back-country seem most suitable for the Central American *Castilloa*, and the flooded tracts on the Sabaki, Tana, and in Witu, for the Para rubber (*Hevea*). The market is very encouraging, and there is no prospect of the supply exceeding, or even keeping pace with, the demand. Lastly, the cultivation of indigo is an industry for which Mr. Whyte anticipates a great future in East Africa.

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* The most southern Sudanese post, Mongalla, is about 20 miles from Gondokoro.

The Lower Sabi Valley.—Mr. Stanley P. Hyatt, contributions from whom on Eastern Mashonaland and on the Sabi river as a waterway have already appeared in the *Journal*, sends us a further note on the country watered by the lower Sabi, which falls within the sphere of action of the Mozambique Company. The junction of the Lundi and Sabi rivers, on the Anglo-Portuguese frontier, marks, he says, the beginning of a complete change in the nature of the country, the dry and stony bush-veldt of the Rhodesian side giving place to the dense green forest of the Portuguese territory, capable of producing every variety of tropical product. The lower Sabi flows through a comparatively shallow valley, the general characteristics of which continue almost unchanged throughout. In the neighbourhood of the river is a belt of large mimosa thorns, alternating with palm scrub or grass-covered vleis. As the ground rises these give place to Mopani scrub, and this again to a veritable forest, containing much fine timber, and gradually forming an almost impenetrable jungle on the upper slopes of the valley. Some of the trees reach a diameter of 8 or 9 feet, and a clear height of 150 feet without branches. One curious tree consists of a large number of small trunks, which in the course of time merge into a single stem. Near the river the soil is of a black, muddy nature, extremely fertile and easily tilled. This gives place to red sand, and ultimately, in the crest of the ridge, to rich yellow loam. The only rock is grey or bright red sandstone, but this is of rare occurrence. The chief wealth of the Sabi valley consists in the indiarubber creeper, which is indigenous on the north bank, whilst on the south it only requires planting. Cotton is found wild throughout the country. So fertile does the land appear to be that the natives raise crop after crop without impoverishing the ground, the principal grain cultivated being the mpundi, or white Kaffir corn, though much arrowroot is grown, and the castor-oil plant flourishes everywhere. The bulk of the natives are of the Mhlengwi stock, though the chiefs are invariably of true Shangaan (Mchangana) blood. The men have mostly been to work at Johannesburg at some period of their lives, and, being poor in cattle, now pay for their wives in [illegible]—a great incentive to such employment. They are extremely industrious, [illegible] their courtesy to the white man forms a refreshing contrast to the insolence [illegible] conceit of the natives of the British colonies. Between the Sabi valley and [illegible] the Crocodile is a smaller valley drained by a large sand-river, said to lose the[illegible] in a sandy plain some 50 miles from the coast. Its only inhabitants are Cro[illegible]shmen of the lowest type, who appear to carry on a relentless war with that [illegible]. The Mhlengwi and Shangaans are all armed with the long bow requi[illegible] arrows, the bow being frequently 7 feet in length, but so stiff that the pr[illegible] Generally speaking, the Sabi valley is not rich in game, the first sigh[illegible] too dense. Elephants are plentiful south of the river, and the Nyala antelope is constantly heard breaking through the jungle, though seldom seen. There are some buffalo, and consequently some amount of tsetse fly, though this is disappearing.

The Chevalier Expedition to the Sources of the Shari.—The Paris Geographical Society has received a communication from M. Chevalier, dated Ndelle, December 25, 1902, which gives some account of the results of the expedition, and is printed in the May number of *La Géographie*, together with a somewhat later letter to Dr. Hamy sent for communication to the *Académie des Inscriptions et Belles Lettres*, which contributed to the funds of the expedition. The expedition has added much to our knowledge of the country of Dar Banda, in the more restricted sense of the term as applied to the country traversed by the headstreams of the Shari, which has long been a raiding-ground of the Arabs from the north. The eastern part of this region forms the state of the Sultan Mohammed es Snussi ben Abasher, with an area of some 50,000 square kilometres, and its capital at Ndelle, in 8° 25′ 5″ N. The country traversed by the expedition is an immense plateau composed of ferruginous sandstones and conglomerates, with a general altitude of from 1500 to 2000 feet, from the surface of which rocky masses, known as *kagas* in the Banda tongue, rise here and there to an additional height of 150 to 300 feet. They are generally destitute of arborescent vegetation, and are composed of sandstones (either horizontal or inclined), or more frequently of granitic bosses. They have supplied points of refuge from the Arabs for the pagan inhabitants, though some that were formerly inhabited are now abandoned. The valleys of the main streams, and large areas besides, are entirely destitute of inhabitants. The country is badly supplied with water. The most important stream crossed—the Kukuru—was 20 yards wide and 4 feet deep on December 3; the Bamingi was rather smaller, and the Bangoran quite a small stream, while their tributaries are at this time either dry or reduced to an insignificant thread of water. Vegetation is naturally scanty, and the most common trees, which include the *Annogeissus leiocarpus*, "Karite" (*Bassia*), "Nete" (*Parkia*), etc., are all characteristic of the Western Sudan. Curiously enough, the baobab and deleb palm (*Borassus*) seem entirely absent. The arborescent *Acacias*, which characterize the more northern regions, are already frequent, and the gallery vegetation of the more southern streams is not to be seen. M. Chevalier has visited, some 50 miles to the south-east of Ndelle, the apparent meeting-point of the three great basins of the Shari, Congo, and Nile. The Bakaka stream, which flowed hence towards Darfur, falls into the Wadi Kabassa, but it is somewhat uncertain whether this is connected at high water with the Bahr-el-Arab, and so with the Nile, or whether it forms a closed basin. Near the source of the Bakaka is the site of Mbelle, an old Krej city now in ruins situated on the caravan route between Dar Sila (Wadai) and the Ubangi sultanates. The streams in this locality are bordered with rich gallery forests some 100 yards wide, in which a wild coffee shrub producing a berry of excellent flavour was found. M. Chevalier suggests that it may have been from this region that coffee was first imported into Europe. Intelligence was obtained of a large lake on the borders of Darfur, called Mamum by the Arabs (probably representing the Wed Mamum of Potagos), which M. Chevalier hoped to visit. Three pagan tribes—the Karas, Gulla Homer, and Fongoro—dwell on its banks, but the Arabs pasture their flocks there in the dry season. Another new lake is also reported to the west of Lake Iro. M. Chevalier says that the Banda people had its origin on the plateau at the junction of the three great river-basins, in the escarpments of which are caverns, which in the slave-hunting days served as refuges to the Bandas, though their inhabitants are now exterminated.

The French on the Lower Niger.—In accordance with the convention of 1898, the British Government has leased to the French two *enclaves* on the Niger, one at the mouth of the Forcados river, which will be named Toutée, and the other at the foot of the Bussa rapids, which will be called the enclave d'Arenberg. The Bussa rapids extend over a distance of about 60 miles, those of Uru, Patassi, and Garafiri being the most difficult. The flotilla of the lower Niger, under the supervision of Captain Lenfant, has navigated the rapids in all seasons except at the height of the dry season, and as the most practicable channels have been discovered, the task has become less difficult. The cost of carriage to Sorbo Haussa has been reduced to about £28 per ton, whereas by the route Dakar—Kayes—Timbuktu it is more than double. Captain Lenfant believes that the Benue may be advantageously used as a route to the Shari. The Mayo-Kebi, affluent of the Benue, flows from the lacustrine depression of Tomburi, separated from the Shari by marshes some 15 miles in extent, which are flooded in the rainy season. The cost of transport by this route to Lake Chad would, according to Captain Lenfant, not exceed £19 per ton, and the time of transit would be reduced by two months. Sketch-maps of the rapids are published in *La Géographie*, No. 1, 1903.

The Loango-Cabinda Frontier.—The frontier between the Portuguese province of Cabinda and the French Congo was delimited in 1901. On the whole, the line follows pretty closely the watershed between the rivers Chiloango and Loéme from Massabé, but certain sections are determined by parallels and meridians. Thus from the watershed to the confluence of the rivers Bilisi and Luali, the boundary follows the parallel of 4° 34′ 24″·5 S., and then passes along the latter river to its source, so as to leave the fertile district of Chimpéze in French territory. In exchange France cedes to Portugal the region between the meridian of 10° 30′ (12° 50′ 15″ E. of Greenwich) and the crest of the elevations that bound Mayombé. The extreme eastern point is at the village of M'Bamba, on the Chiloango, in lat. 4° 38′ S. and 10° 40′ E. long. (13° 0′ 15″ from Greenwich). The region traversed by the commission may be divided into five zones. Near the coast the country is flat, and the Loémé winds sluggishly amidst papyrus. The soil is sand and clay, and the vegetation consists of tall grass and woods in the hollows. The next zone is more diversified, the vegetation is of higher growth, and the population denser. Then in Mayome is a zone of forest and hilly country where the rivers flow over bars of schists and granite; the vegetable earth is of small depth, but the vegetation is abundant, and the natives are strong and healthy. In the third zone are clay-slates and schists of several kinds, and here the forest attains its greatest luxuriance. Quartzites, quartose sandstones, and laterite from the land of the fourth zone; the forest is less dense, grass only growing on the laterite. East of the Franco-Portuguese frontier is the plain of the Yangalas, extending from the Chiloanga to the Kwilu, which seems to be the ancient bed of a large river. The surface is covered with laterite, and in the rainy season the whole country is inundated. Beyond the plain the land rises again, and a region of sand and limestone stretches to the copper district of Minduli. Formerly the ore was extracted by the natives, but is apparently neglected at present.—*La Géographie*, No. 1, 1903.

Madagascar in 1901.—M. Grandidier publishes in *La Géographie*, No. 1, 1903, a summary of General Gallieni's report. The commerce of the island in 1901 was of the value of 55 million francs (£2,200,000) as against 51 million (£2,040,000) in 1900. Of this sum £1,960,000 represents trade with France and her colonies. The value of the imports was £1,840,000, and of the exports only £360,000. The most important import is cotton goods, which in 1901 were of the value of £480,000, or £60,000 more than in the preceding year. The sale of cotton goods is generally regarded as a criterion of the prosperity of the natives. Large stocks may, indeed, have been accumulated in the year in question with a view to a demand in the future, but, at any rate, the local merchants must have faith in the progress of the island. Rice occupies the second place among the imports, though Madagascar ought to be an exporting country. The scarcity of roads to carry off the surplus crops discourages this cultivation, and in 1901 locusts caused enormous loss. Progress, however, has been made since 1896, and it is hoped that Madagascar will soon yield enough rice for the local demand. The exports in 1901 showed a diminution of the value of fully £60,000. The chief articles are gold, raphia fibre, and cattle. The value of the gold exported was less by £12,000, and that of raphia by £3400, owing to the fall in the price, for the quantity exported was larger. There was a lively demand for cattle in Réunion, Mauritius, and, above all, South Africa, but the native graziers asked such extravagant prices that the result was a diminution of £13,700 in the value of the cattle exported. Shipping has much increased, and inland transport has made good progress. Native cultivation has been extended, and the number of cattle has risen, so that there are now at least 1,600,000 head in Madagascar. The mining industry has remained stationary. In 1901 provisional titles were granted to emigrants for 369 concessions, bringing the number since 1895 up to 1674, which cover an area of 335,112 acres. There are, besides these, thirty-seven concessions of more than 10,000 hectares (24,710 acres) each.

AMERICA.

The Seward Peninsula, Alaska.—In consequence of the discovery of gold in the Nome district, and the rapid development of mining, the United States Geological Survey sent out a party in 1900 under Mr. Alfred E. Brooks to examine the southern part of the peninsula. The 161st and 168th meridians bound the peninsula approximately on the east and west, while Cape Darby, the most southern point, lies a little south of 64° 30′, and Cape Espenberg on the north is just within the arctic circle. The area of the peninsula is about 20,000 square miles. Its western shore is skirted by a low plain with lagoons and sand-pits, while in the eastern half the coast is bold and rocky. The interior is occupied by uplands 800 to 2600 feet in height, surmounted by isolated peaks and knobs which rise 1500 to 2000 feet higher. In the southern half of the peninsula is a fairly well-defined range divided into three groups—the Kigluaik, Bendeleben, and Darby mountains. The first run about 40 miles from near Cape Woolley to the flat valley of the Kruzgamepa river; they are rugged, and culminate in Mount Osborn at a height of 4700 feet. The Bendeleben mountains extend for 50 miles between the Kruzgamepa and the Kuzitrin, are less rugged, and take their name from the highest peak, about 3500 feet. The Darby mountains, 40 miles long, run northwards from Cape Darby, and have rounded summits not more than 2000 feet high. The York mountains, which run northwards from the cape of the same name, have been little explored; they are rugged like the Kigluaik, and contain peaks rising to 2500 feet. The most striking features of the topography are the broad flat-bottomed valleys, such as the basins of the upper Fish river, the upper Kuzitrin, and the lowland through which flow the Kruzgamepa and upper Niukluk. Mr. W. C. Mendenhall, who ascended the west fork of Koyuk river to a distance of 136 miles from the coast, reports that the hills north of the upper Koyuk are not more than 1200 or 1300 feet high. The first rapids met with were 113½ miles up the river. The oldest rocks of the peninsula are highly crystalline limestones and schists, first noticed in the Kigluaik mountains, among which granite and gneissoid rocks occur abundantly. The type rock of the Kuzitrin series is a graphitic quartz-schist; the beds are, perhaps, 2000 to 3000 feet thick. The Nome series is made up of limestone, graphitic mica and calcareous schists, and at one locality show a minimum thickness of 5000 to 6000 feet. If certain fossils discovered north of Port Clarence belong to the Nome series, its lower beds are of Lower Ordovician age, while the other two series may be Cambrian or pre-Cambrian. On the Fish river beds, probably of the Nome series, contained Mesozoic fossils. Greenstone is widely distributed. Gold has been found along the coast near Nome, and at several points on the rivers inland. The output of placer gold for the year 1900 has been estimated at £984,690.

The Austrian Expedition to Brazil.—A preliminary report has been received from the leader of the second expedition sent out to Brazil by the Royal Academy of Sciences of Vienna. After landing at Pernambuco, two excursions were made by rail to the neighbourhood of Berberibe and Pas d'Alho, which gave a foretaste of the enormous wealth of bird-life in those tropical regions. A similar impression was made by excursions round Bahia, to Cabula, Rio Vermelho, the neighbourhood of Barra near the Bahia lighthouse, and even on the outermost slopes, covered with vegetation, between the east of the town and the sea. Here was first seen the *Wistiti* (*Hapale Jacchus*), which is peculiar to Bahia and Pernambuco. On the journey to the Rio Sao Francisco extensive ornithological collections were made; a week was spent at Joazeiro, on the right bank of the great river. An imposing representative of the bird world here is the Nandu, or Ema (*Rhea macrorhyncha*). The characteristic mammals of this region are the armadillo (*Dasypus*), pouched rat, and anteater. Fish are abundant in the river, but there are not many species. The Pirá (*Conarhynchus conirastris*), with a long curved tube-shaped snout, and Pacri (*Myletes*), with a shark's mouth, are remarkable, being of larger size than most of the others. Hofrath Steindachner expects a particularly rich yield of fishes characteristic of the region from the stay at Barra, where the Rio Grande flows into the Sao Francisco. Lacertilians are represented in the neighbourhood of Joazeiro by eight or nine species, including a very delicate dark-striped Scincoid with a blood-red tail. Most of the small variegated or dark-coloured snakes of this region are said to be poisonous. The Ema mentioned above is greatly valued as a destroyer of snakes, and is kept on the haciendas. The kites do their utmost in destroying animal "undesirables," and enjoy the greatest favour all over the country. The whole bird-life of the Joazeiro district resembles that of the Amazon region more closely then that of southern Brazil. In the middle of March the desolate solitudes of the bush were explored, starting from the railway at Carnahyba, and a nearly complete collection of the birds, consisting of some fifty specimens was made. The most characteristic representatives are five species of pigeons and two of parrots.

Expedition to the Central Andes of Bolivia.—Prof. Steinmann, of Freiburg, and two of his fellow-geologists of the same University (Baron Bistram and Dr. H. Hoek), will start in August for Buenos Ayres, *en route* for the Bolivian Andes, which will be reached *via* Jujuy, Tarija, Sucre, and Cochabamba. After a prolonged stay in the mountains the travellers will probably work their way to Antofagasta *via* La Paz. The outfit is of the most modern description, and Dr. Hoek is one of the most capable German mountaineers.

POLAR REGIONS.

Arctic Expeditions.—Captain Roald Amundsen, whose projected expedition to the northern magnetic pole has been fully described in the *Journal*, sailed from Christiania on June 16. He hopes, if possible, to return through Bering Strait, thus once more accomplishing the north-west passage. The Ziegler expedition of the present year, under the leadership of Mr. A. Fiala, made a final start from Tromsoe on June 27, intending, however, to call at Archangel before reaching Franz Josef Land.

The German Antarctic Expedition: Return of the "Gauss."—Telegraphic information was received on June 2 that the *Gauss*, with all well on board, had arrived at Durban *en route* for Cape Town. From the scanty details yet made public, it appears that the expedition has been a successful one, the *Gauss* having behaved splendidly, though the highest latitude reached by the ship was 66° 2′ S., or just outside the antarctic circle, where winter quarters were established off a newly discovered land in 89° 48′ E. long. The ship was frozen in in ice 30 feet thick, while the snow was 30 to 40 feet in depth. Sledge-journeys appear to have been made during the stay at the winter quarters, and many members of the expedition are said to have suffered from frost-bite and snow-blindness. Further details, which will be awaited with much interest, should be available before long, as the leader, Dr. von Drygalski, forwarded his report immediately on arrival at Durban. Among the geographical results of the expedition is the discovery of the non-existence of Termination island, the site of which was passed over by the expedition, while no trace of land was seen in the neighbourhood.

Nordenskiöld Relief Expeditions.—As already announced, an expedition is being organized in Sweden for the relief of Dr. O. Nordenskiöld, who has been unable to return north during the past season in accordance with his original plan. The sum of 200,000 kronor, voted by the Swedish parliament, has been supplemented by contributions from private individuals to the extent of 50,000 kronor, and the Norwegian steamer *Frithjof* has been hired for the purposes of the expedition, which will start from Stockholm about August 15. Its leader is Captain O. Gylden, of the Royal Swedish Navy, son of the late well-known astronomer, and captain of the *Antarctic* during the voyage to Spitsbergen in 1901, in connection with the operations for the measurement of a degree. Some anxiety is naturally felt for Dr. Nordenskiöld and his party, but it is hoped that the supplies taken out, which would be barely sufficient for a second winter, may be supplemented by the fresh meat afforded by seals and penguins. At the instance of Dr. Moreno, the Argentine Government has also decided on the despatch of a relief expedition, should no news of the explorers be received before the next spring of the southern hemisphere.

MATHEMATICAL AND PHYSICAL GEOGRAPHY.

Prof. Agassiz on Barrier Reefs and Atolls.—In a communication to the Royal Society, read in March last, and printed in vol. lxxi. of the *Proceedings* of that body, Prof. A. Agassiz sums up the results of his twenty-five years' observations on coral formations in the Atlantic, Pacific, and Indian oceans. He has made no attempt to establish any general theory, but has confined himself to a description of the different types of reefs and of the causes to which they probably owe their formation. The barrier reefs of Fiji, Hawaii, and the West Indies are found to usually flank volcanic islands, and to be underlaid by volcanic rocks. Those of New Caledonia, Australia, Florida, Honduras, and the Bahamas are underlaid by outliers of the adjoining land masses, which crop out as islands on their very margins. In the case of some barrier reefs, in the Society islands and elsewhere, wide and deep lagoons have been formed by erosion, from a broad fringing reef flat, while encircling reefs hold to their central island or islands the same relation which a barrier reef holds to the adjoining land mass. Denudation and submarine erosion fully account for the formation of platforms, upon which the various organisms may build either barrier or encircling reefs or even atolls. Another type is formed by the reef-flats and outer reefs flanking elevated islands—either wholly composed of limestone or in part volcanic—in the Paumotus, Fiji, and elsewhere. They partake of the nature both of barrier and fringing reefs. A passage may be traced from such elevated islands, like Niue, through various forms to that of atolls in which only a small islet or larger island of the limestone or volcanic rock remains. Sometimes the underlying base of the atoll is not known, and some atolls are mere shallow sinks formed by sandbanks. Throughout the Pacific, the Indian ocean, and the West Indies positive evidence exists, in the form of bosses, pinnacles, and undermined masses of modern or Tertiary limestone, of a moderate, recent elevation of the reefs. Signs of the solvent action of the sea are also to be seen everywhere, while atmospheric denudation has played an important part in reducing elevated limestone islands to the level of the sea. Closed atolls can hardly be said to exist (there being always some means by which the lagoon is fed by the sea), and the land area of an atoll is relatively small compared to that of the half-submerged reef-flats. The Maldive archipelago supplies overwhelming testimony that atolls may rise from a plateau of suitable depth, however it may have been formed, and whatever its geológical structure. The great coral-reef regions are within the limits of the trades and monsoons, and are areas of elevation, with the exception of the Ellice and Marshall, and some of the Line islands. In the regions examined, the modern reef-rock is of very moderate thickness, within the limits of depth at which reef-builders begin to grow, and within which the land rims of atolls or barrier reefs are affected by mechanical causes. The Marquesas, Galapagos, and a few other islands, though within the limits of the coral areas, have no reefs, owing to the steepness of their shores, and to the absence or crumbling nature of their submarine platforms. Lastly, it is pointed out that corals grow sparingly in lagoons where coralline algæ grow most luxuriantly, and that nullipores and corallines form an important part of the reef-building material.

Ice in Rivers.—Observations of the number of days on which ice has been present in the river Hahle at Duderstadt (South Hanover) have been kept almost continuously since 1893 by Herr L. Koch, who gives a summary of the general results of the observations in the *Deutsche Rundschau für Geographie* (vol. 25, part 6). The writer remarks that the temperature of the water has a much greater influence on the duration of an ice-covering of rivers than that of the air, and that December on this account has on the average fewer days on which the streams are ice-bound than either January or February, as, however low the air-temperature may fall in the early part of the winter, the water still retains some amount of warmth. In February the cooling of the water is counteracted to some extent by the rising temperature of the air, so that the number of days then shows some diminution. Thus during the period of observation the number of days on which the river was entirely ice-bound averaged, for the three months respectively, 1·3, 3·1, and 2·6. The conditions seem, however, equally favourable to the formation of loose ice in February, which shows a fractionally higher average number of days with such ice than even January, the figures being 2·6, 4·8, and 4·9 for the three winter months. The average total number of days with ice during the winter was 21 (the extremes being 35 and 4), but on seven only, on an average, was the river entirely ice-bound. Last winter was an abnormal one in the extent of the ice-formation in the early part of the winter, the figures for December alone surpassing the average for the whole winter.

Alpine Glaciers in their Relation to Rivers.—In the *Rivista Geogr. Ital.*, No 3, 1903, Prof. Marinelli gives a summary of the researches of the engineer

Signor Fantoli concerning the contribution of glaciers to the river discharge. He has measured the areas of the glaciers in the Verbano (Maggiore) and Lario (Como) basins. In the latter the glaciers occupy an area of nearly 67 square miles, or about 3·8 per cent. of the whole basin (1795 square miles), while in the Verbano they cover 42 square miles, or about 1·8 per cent. of the basin (2394 square miles). These data are drawn from the last Italian and Swiss surveys, and refer to about the year 1855, when the extent of the glaciers was a minimum. Measures from maps of the middle of last century give an area in the Verbano basin of nearly 49 square miles, or 16 per cent. larger. From a careful examination it has been found that during the warmest days of the year two-thirds of a cubic metre per second are removed from each square kilometre of the glaciated area, which correspond to a thickness of 5–6 centimetres (2–2·4 inches) in the day, while the drainage from the parts of the basin not covered with ice amounts to only 10 litres per kilometre, or only a sixty-seventh of the above. Consequently, during the dry summer season the glaciers of the Verbano, with their area of 42 square miles, contribute more than half the total drainage of the basin, and in the Lario basin more than two-thirds. A rise of one degree (C.) of temperature at this season removes from the glaciated surface an additional thickness of 0·45 centimetre (0·18 inch) per day, whereas in the basin of the Rhone the increase is only 0·24 centimetre (0·09 inch). The explanation of this difference may be found in the fact that in the latter basin 60 per cent. of the glaciers lie above 3000 metres (9800 feet), whereas in the Verbano basin the percentage is 22·5, and in the Lario 38·5. Observations are wanting to determine the action of heat at different hours of the day. Signor Fantoli has also studied the effect of condensation of vapour from the air in contact with the glaciers. In the Lario basin he calculates that in August the vapour condensed amounts to about 2·5 litres per second and per kilometre. And, again, the latent heat thus set free produces a fusion of ice which he calculates at 19·5 litres per second and per kilometre. The total fusion from this source is, then, 22 litres (12·6 gallons per square mile), while the total discharge of the glaciers is 46·8 litres (26·7 gallons).

OBITUARY.

Thomas Godolphin Rooper.

It is with great regret that we have to record the death of Mr. T. G. Rooper, M.A., one of His Majesty's inspectors of schools. Mr. Rooper was warmly interested in all sound educational methods, and possessed in the highest degree the power of communicating his enthusiasm to others. His loss in the educational world can hardly be overestimated, and the cause of geography in particular has lost a valuable and influential supporter. When stationed at Bradford, he did much to stimulate an interest in geography, and to improve the methods of teaching it by organizing a geographical exhibition, starting and paying for the first Teacher's Certificate classes, planning geographical readers on sound principles, securing the production of an excellent contoured wall map of Yorkshire, as well as by lectures and private conversations. In Southampton he took the leading part in the foundation of the Southampton Geological Society, which owes much of its success to him. Mr. Rooper became a Fellow of the Royal Geographical Society in 1895, and served, up till the time of his death, on the Special Education Committee. He prepared a report on "Hints on the Drawing up of Syllabuses of Geography for

Elementary Schools," which, unfortunately, he did not live long enough to finish. This report, completed by Mr. Chisholm, will shortly be published. Mr. Rooper may be said to have died, as he would himself have wished, in harness. He possessed a singularly lofty character and an attractive personality. His friends and colleagues have to deplore the loss of a truly lovable and high-minded man as well as of a devoted public servant.

CORRESPONDENCE.

The 'Tanganyika Problem.'

I MUCH regret that, in venturing to criticize some of the geological, palæontological, and zoological speculations in Mr. Moore's 'Tanganyika Problem,' I should have incurred that gentleman's anger to so serious an extent as to have caused him to write the sarcastic letter which appeared in the *Geographical Journal* for June (p. 682). Mr. Moore might, I think, have remembered that a recourse to sarcasm in place of argument generally indicates that a speaker or writer has a bad case—and knows that he has. To the greater part of Mr. Moore's letter it is unnecessary to reply, but there are a few scientific questions of importance involved, and it is as well to clear them up. To prevent any misunderstanding, I must say that my omission to notice some of the statements contained in the letter does not imply that I admit that those statements are correct.

The greater part of Mr. Moore's letter is, in fact, a very good specimen of what is commonly known as special pleading, and I can congratulate the writer on the skill with which, in several cases, he has suggested an inference favourable to his views without committing himself to a definite statement, or he has credited me with his own mistakes. As one instance, I may call attention to his remarks (p. 683) on a certain echinoderm cited as evidence of the marine origin of the Drummond's beds. As these beds are classed by Mr. Moore as Triassic (they are, in fact, older, as will be seen presently), and the echinoderm was stated by him to be Oligocene, I pointed out that this fossil could not have come from the Drummond's beds at all. "But," Mr. Moore replies, "is it an Oligocene species, and if so, is this species possibly Triassic also?" Now, the Oligocene age of the fossil rests upon Mr. Moore's statement, not mine (I shall have occasion to refer to this matter again), and I can hardly suppose that Mr. Moore is so ignorant of elementary palæontology as not to know that echinoderms are some of the most characteristic fossils known, and that the idea of a species being both Tertiary and Triassic is absurd. So far as is known, no species, scarcely a genus, and only a small minority of the families of echinodermata found in the two periods are common to both.

Another instance in which Mr. Moore charges me with his own error is to be found in his observations, at the bottom of p. 682 and the top of p. 683, on my remark that the bivalve shells of Lake Tanganyika are exclusively fresh-water types. Mr. Moore had referred all of them to purely fresh-water genera, and I accepted his determinations.

It may be noticed that in the commencement of his letter Mr. Moore compares himself to a military leader, and he naturally adopts military methods. The examples just cited are *ruses de guerre*. I have no wish to waste time upon these purely polemical matters, but, as I have stated, there are a few questions of scientific interest, and to these I will reply briefly.

To take a purely geological point first. Mr. Moore, at the end of the third paragraph in his letter (p. 683), dealing with the "rift-valleys," states that "these valleys are usually folds, they are not 'longitudinal blocks let down by trough faults,' as Dr. Blanford dogmatically asserts." May I beg every reader who wishes to form a judgment on this matter to turn to the lower diagrams on the plates opposite pp. 42 and 44 in Mr. Moore's book, 'The Tanganyika Problem'? It requires very little familiarity with geological sections to enable any one to judge whether these sections agree with Mr. Moore's account of the structures or with mine. My description of the nature of the valleys was founded on the accounts by Suess and Gregory, confirmed by Mr. Moore's own sections.

Probably the most important geographical question noticed in Mr. Moore's letter is that relating to the so-called Drummond's beds on Lake Nyasa, because his argument that the sea occupied parts of Central Africa in early Mesozoic times is an essential part of his proposed solution of what he terms the Tanganyika problem, and his attack on the views of Murchison and Gregory ('Tanganyika Problem,' pp. 32, 72, etc.; 'Great Rift-valley,' p. 214), who held that Central Africa has never been under the sea, are mainly based on the evidence afforded by the Drummond's beds' fossils, no organic remains being known from the other Mesozoic and Palæozoic rocks of the area. I gave reasons (p. 290) for not accepting the marine origin of the Drummond's beds, and for believing it more likely that these deposits, like the Karoo formation of South Africa, are of fresh-water origin and largely fluviatile. Mr. Moore replies, "It may be stated for general information that these beds (Drummond's) are like nothing at all in South Africa, and whether they are marine or not, they are not fluviatile, unless deposits like our Lancashire limestones are to be considered as having originated in rivers." I may point out that I did not say that the Drummond's beds were like anything in South Africa. I wrote of them as representative, but I question whether Mr. Moore's acquaintance with South African geological formations justifies his sweeping assertion of the difference between the two. I do not think I am misinterpreting Mr. Moore's remark about the limestones if I understand him as expressing an opinion that rocks "like our Lancashire limestones" (carboniferous limestone, I presume) are evidence that the strata in which they occur are not of fluviatile origin. If this is his meaning, Mr. Moore is mistaken. Limestones are of frequent occurrence in fresh-water beds, whether fluviatile or lacustrine. I think most British geologists must know the limestone beds in the Hastings sands, which are generally regarded as deposited by rivers; and I may add that calcareous beds, which in older rocks would become limestones, abound in some of the fluviatile deposits of the Ganges and its tributaries. The limestone did not necessarily "originate in rivers" as limestone, but is probably due to the subsequent percolation of water containing salts of lime in solution.

The facts about the Drummond's beds are very imperfectly stated in 'The Tanganyika Problem,' and certain data which are of great importance as evidence of the origin of these strata are not mentioned. I have, therefore, tried to ascertain something more of these beds, with the following result (the facts are taken from Mr. J. Stewart's paper, *Proc. Roy. Geo. Soc.*, vol. iii., 1881, pp. 264, etc.; Prof. Drummond's 'Tropical Africa,' 1881, pp. 183–199; and an article by Prof. Rupert Jones in the *Geological Magazine* for 1890, p. 553).

The beds in question are represented in Mr. Moore's map, opposite p. 48 of the 'Tanganyika Problem,' as occupying a considerable area west of Lake Nyasa, near its northern end. They consist, according to Prof. Drummond, of "thin beds of very fine light grey sandstone, and blue and grey shales with an occasional band of grey limestone." Some coal occurs in the neighbourhood, and is apparently associated with the same strata. (Mr. Moore has omitted to notice the occurrence of this coal.) In some of the beds remains of ganoid fishes and bivalve mollusca were found by Prof. Drummond; the fishes were described by Prof. Traquair, and referred to *Acrolepis*, a Palæoniscid ganoid, and the mollusca were doubtfully assigned by Prof. Rupert Jones to the genus *Iridina*. The latter have been re-examined by Prof. Amalitsky, who (*Quart. Jour. Geol. Soc.*, 1895, p. 341) refers them to the fresh-water Permian genera *Palæomutela* and *Palæanodonta*, belonging to a group from which the modern *Unionidæ*, or pond mussels, may possibly be descended. Closely allied, if not identical species, of the two molluscan genera named occur in the fresh-water Permian strata of Russia, and in the Karoo series of South Africa at Kimberley, Graff Reinet, and other places, and in the latter localities, or some of them, as in the beds on Lake Nyasa, remains of the ganoid genus *Acrolepis* accompany the mollusca. Quite recently (*Quart. Jour. Geol. Soc.*, 1903, pp. 285–287) the same association of *Acrolepis* and *Palæomutela* in coal-bearing strata has been reported from Rhodesia. Similar land-plants (*Glossopteris*, etc.) and terrestrial reptiles are met with in both the Russian and South African rocks, and these formations, in which no marine fossils have been found, are generally admitted to be fresh-water deposits. Prof. Rupert Jones formerly regarded the mollusca from the Karoo beds as of estuarine or salt-lake rather than of river origin; and I was myself at one time disposed to think them estuarine or marine, but the reasons for the view I then held no longer exist, further discoveries of the relations between the floras and faunas of the Permo-Carboniferous beds in South Africa and Russia having made it evident that both areas in Upper Palæozoic times were parts of the same continental tract.

It may be added that the same kind of *Palæanodonta* as that occurring in the Drummond's beds was obtained by Gregory from rocks in the Sabaki valley near Mombasa, and recognized by him as evidence of the fresh-water origin of the rocks.

I have thus accounted for the ganoid fishes and bivalve mollusca of the supposed marine beds of Nyasa. The so-called Oligocene echinoderm is a mystery, for although Mr. Moore ('Tanganyika Problem,' p. 72) professes to take the statement of its occurrence from 'The Great Rift Valley,' p. 230, there is no mention on that page, nor, so far as I can trace, elsewhere in Prof. Gregory's book, of any Oligocene echinoderm; although there is a reference to an Eocene fossil, whether an echinoderm or not is not stated. This, however, is of minor importance. The fossil, whether Oligocene or Eocene, could not have come from the Drummond's beds, as I pointed out before.

I am sorry that there should be occasion to repeat these rather dry details, but as Mr. Moore has replied to my criticism of his book by charges of false assumptions and hints that my assertions were unfounded, I am obliged to show what is the evidence on which I depend, and what is the worth of the statements and assumptions contained in such phrases of his as the following ('Tanganyika Problem,' p. 72): "It would thus appear that at some time there was in this region (Nyasa) a fauna consisting, at any rate, of ganoid fishes, echinoderms, and molluscs, or, in other words, a marine fauna." And again (p. 73): "Thus it would appear that there was once a marine, possibly a Triassic or Jurassic, fauna in the region of the north end of Nyasa."

Mr. Moore expresses his contempt for conchology, which he says he always regarded "as somewhat trivial—as, in fact, more of a waste of time than a science," and his remarks on geological and palæontological questions appear to show that he has the same low opinion of palæontology and geology. To judge by the instances already given, Mr. Moore's views on geology and palæontology are not founded on a thorough acquaintance with those sciences. With reference to his contempt for conchology, it should not be forgotten that his evidence of the Jurassic affinities of the halolimnic mollusca of Lake Tanganyika is, as he quite fairly states, entirely conchological. But if the Jurassic affinities of the halolimnic mollusca are founded on trivialities, and the older Mesozoic sea of Central Africa on evidence half of which is ignored and the other half misinterpreted, what becomes of Mr. Moore's solution of the 'Tanganyika Problem'?

The points about the *Pseudo-melanias* and the migration of *Tilapia burtoni* are really unworthy of reply. There is no evidence that *Tilapia burtoni* migrated from Tanganyika to Kivu after the latter became a lake, or that *Melania tuberculata*, which inhabits both lakes also, wandered from one to the other. Either or both may have inhabited streams in the Kivu area before Lake Kivu existed. Of course, Mr. Moore does not imagine that *Limnea*, *Planorbis*, *Vivipara*, and *Unio* all descended from the *Pseudo-melanias*, but if not, his reply is worthless. The only case in which a remark of his is really worth attention is that in which he compares Huxley's suggestion of what that author calls the polyphyletic descent of certain genera to his own hypothesis of the origin of fresh-water faunas. No doubt there is a certain connection between the two ideas, but at the same time Mr. Moore's hypothesis is much more akin to the sporadic theories of authors like Alcide D'Orbigny and Louis Agassiz, than to Huxley's polyphyletic hypothesis.

There is one more paragraph of Mr. Moore's that requires notice. In the 'Tanganyika Problem,' p. 20, he states emphatically that there is no evidence that there has been any connection between Africa and America since the origin of types now common to both. I suggested that Mr. Moore could not have been acquainted with the writings of Suess and others; and his reply is rather surprising. "Well," he says, "but what if I had read Suess's 'Antlitz der Erde,' if I knew something of Beddard's and Neumayer's observations, if I have also a vivid recollection of several discussions with Dr. Gregory upon this very subject, and if, after all this, I had and still 'hae mi doots' about there ever having been a connection between the continents at all?" I can only reply that in that case it is unfortunate for Mr. Moore's credit for scientific accuracy that he should have "dogmatically" asserted that no evidence existed, and still more unfortunate that he should regard his error as a cause for self-laudation. I should never have suspected Mr. Moore of having deliberately denied the existence of evidence with which he was well acquainted if he had not admitted his knowledge, and I do not think his reputation as a scientific writer will gain by his confession. I can only suggest that, having failed to find in my criticism of his work an illustration of what he elegantly terms "explosive arguments which have a nasty habit of going off inside his own trenches," he has been minded to afford a brilliant example of his own figure of speech.

I may say, however, that despite Mr. Moore's "doots," biological evidence as to the former land-connection between Africa and South America has accumulated rapidly of late. Two papers on the subject have been sent to me by their authors since my review of the 'Tanganyika Problem' appeared in the March number of this *Journal*, and I have seen the abstract of a third. The first of these, by Dr. Scharff, entitled "Some Remarks on the Atlantis Problem" (*Proc. Roy. Irish Ac.*, vol. xxiv.), contains a large amount of detailed information on the biological relations of the two continents; the second, by Dr. A. E. Ortmann of Princeton University, entitled "The Geographical Distribution of Fresh-water Decapods and its Bearing upon Ancient Geography" (*Proc. Am. Phil. Soc.*, xli., 1902, pp. 267–400), is a most important contribution to the discussion; and the third, by Mr. R. I. Pocock, read before the Zoological Society in April last, was on the "Geographical Distribution of the

Megalomorphæ" (spiders). All these writers show that strong evidence exists in favour of a former union between Africa and South America. It should be added that no groups of animals are better adapted to the study of ancient distribution than spiders and fresh-water crustaceans.

There is one remark I must add in conclusion, and that is that I shall not notice any further contributions of Mr. Moore's to this discussion, unless such contributions are written in a very different tone from that adopted by him in his letter published in the last number of this *Journal*.

W. T. Blanford.

Ptolemy's Scotland A.D. 140, and the Latest Upheaval on the West Coast.

Poltalloch, Lochgilphead.

The hill Dunadd, beside the river Add, stands about 2 miles from my house, and has long been a source of great interest to me.

There are evident geological signs that at one time the present Loch Awe, then a river, flowed to the sea between the site of my house and Dunadd, the stronghold in Scotland for at least two hundred years of the Dalriad kings, who came from Ireland. To a military eye Dunadd has now not much to specially recommend it as a place of strength for men whose connections were with Ireland, as between it and the sea stretches the big Crinan moss, through which the river Add winds its devious course; but if the sea came up to the foot of the hill or close to it, and the Awe as well as the Add flowed into the larger Crinan bay, then the military eye, in the days before gunpowder, would rejoice in the site.

I have long sought to find proof that in the comparatively recent days of the Dalriads the Awe did flow into Crinan bay, and to find the date when it ceased to do so. I think I have found both.

Ptolemy, in his map of Scotland dating from *circa* A.D. 140, shows his first station northwards from the Epidium Promontorium, or Mull of Cantire, as *Λόγγου ποταμοῦ ἐκβολαί*. This station is 1⅓ degree east * from the Promontorium—a distance which, when converted into stadia on the Ptolemaic basis of 500 stadia to an equatorial degree, gives 400 stadia, or 40 nautical miles. Crinan bay, I find by Admiralty chart, is 48 miles, not far from the 40 of Ptolemy. I leave it to others to decide whether the Longus or Λόγγος of Ptolemy is or is not a proper name—that is, whether the meaning is the mouth of a long river or of the long river, or of the river called "Long," merely noting that he writes a Latin word in Greek letters, but it may be of interest to know that the meaning attached to the Gaelic name Fada, now called Add, is Long. I further find that A.D. 736 Dunadd was attacked and taken. Also the Annals of Ulster state that there was an earthquake in Ile (the Islay of to-day?) in A.D. 740, and that Dunadd was given up in A.D. 741.

It thus seems to me to be evident that the earthquake which accompanied the great [illegible] along the west coast of the Highlands and which tilted up the bed of the Awe, damming the river and making it flow through the then opened pass of Brander, occurred A.D. 740. Also that Longus (Λόγγος) was probably the Greek translation of the native name of the river, the Long, for it had its rise in the springs of the Orchy and Stral, and was really a river of considerable length, and Ptolemy's map shows that it was flowing properly as late as A.D. 140. But when the upheaval came, Dunadd would be cut off from the sea, and most probably a horrid marsh took its place, making it worthless as a stronghold.

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* Ptolemy's map, as is well known, makes Scotland lie west and east instead of north and south, and this station is really on the west coast of Argyll.

Moreover, I think it not unlikely the name Long adhered to the river which continued to flow into Crinan bay, being shifted from the former Awe to the present Add.

I claim no credit for abstruse researches; only a little local knowledge and an interest in the question. My facts come from a series of papers by the late Captain Thomas, R.N., contributed to the Society of Scottish Antiquaries some years ago.

E. D. MALCOLM,
Colonel late R.E.

MEETINGS OF THE ROYAL GEOGRAPHICAL SOCIETY, SESSION 1902–1903.

Anniversary Meeting, May 18, 1903.—Sir CLEMENTS MARKHAM, K.C.B., F.R.S., President, in the Chair.

THE Secretary read the minutes of the last Anniversary Meeting.

ELECTIONS:—*General Sir G. Digby Barker, K.C.B.; Commander Cuthbert Chapman, R.N.; Captain Henry Langrishe Cottingham, R.F.A.; James Currie; Lieut. John McClean Griffin, R.F.A.; Richard A. Hall; Henry Caborn Harper; Captain Claud Percival, Rifle Brigade; Jamieson Robertson; Hobart Chatfield Chatfield-Taylor.*

The presentation of the awards then took place.

The PRESIDENT: Mr. Douglas Freshfield, the Council has selected you as the recipient of the Founder's Medal this year, and the selection has received the approval of His Majesty the King. The Council considered that you had well earned the Medal by your explorations commencing thirty-six years ago in the Caucasus and continued on several other occasions, during which time you made very important additions to our knowledge of the physical geography of that important range of mountains, and also for your journey at a very high level round Kanchinjunga, on which occasion you added largely to our knowledge. There were your services in the field, for which you have so well earned this medal. But the Council was also mindful of your long services to geography during a course of upwards of thirty years, and especially of the valuable work you have done in promoting geographical education. It is a great pleasure to me that it should be my duty to present the medal to you, when I remember the long term of years during which we worked together for a common object, always preserving friendly and harmonious relations with each other, and I now have much pleasure in placing the Patron's Medal in your hands.

Mr. DOUGLAS FRESHFIELD: It is now my duty to express to the Council my sincere gratitude for the very kind appreciation they have shown of my geographical career by recommending me to His Majesty for the Founder's Medal, the oldest honour which is in the gift of the Society. I think few recipients have been in a position to appreciate it more thoroughly than I am, for during the fifteen years I served on the Council, or as one of your hon. secretaries, I had constant and frequent opportunities of watching the extraordinary care and solicitude which the Council showed in choosing candidates for these medals, in looking not only over the wide field of Great Britain and its Colonies, but over the whole world and selecting those they thought best qualified, irrespective of nationality. We are none of us good judges in our own cause, and surprised though I am that this honour comes late to me in life, it is not for me to dispute the wisdom of the Council; but I cannot help thinking that they may have been influenced by sympathy with the aims I have had in view rather than by any actual successes I may have won, either as a mountaineer or an explorer, or as an educational geographer. If you will allow me, I will briefly put before you the record of what those aims have been. I have, during the last fifty years, frequented the Alps, explored the Caucasus, and visited one of the regions—perhaps the most interesting—of the vast Himalaya. As a mountaineer, I have tried to prevent mountaineering from becoming a form of sport and to keep it in its proper place as a branch of travel. By precept and example I have done my best to persuade my comrades to keep their eyes open to all the interest, historical, scientific, and artistic, in which the mountains abound. In doing this, I have followed in the footsteps of your old colleague, Mr. John Ball, who devoted his time to first exploring and then describing the Alps at a time when many geographers thought them beneath their notice. You have been kind enough, sir, to refer to the small part I have played in geographical education. Twenty-six years ago, when Mr. F. Galton first drew the attention of the Council to the work which was needed in this direction, I took the matter up. Since then a great deal has been effected. We have, in the first place, our old casual *Proceedings* turned into the *Journal*, the most important publication of its kind in Europe, mainly kept in that position by my friend Mr. Keltie's care. We have brought photography into full play to illustrate the evening lectures as well as the articles in the *Journal*. We have done a great deal to persuade the controllers of the Ordnance Survey to bring it up to the level of other countries. I think the present Director has fulfilled every single demand we have made on him. And, last of all, more strictly educational—I am not going into details—we have succeeded in establishing a flourishing School of Geography in the University of Oxford, a School which has already spread its influence through the rest of the kingdom. We have done much besides which I must not dwell upon. In all this work, sir, I have been acting on lines you started, or with your full sympathy. You, Mr. Chairman, preceded me and succeeded me, and you must allow me to say it is with peculiar pleasure that I take this medal from the hands of one to whose inception, energy, and untiring devotion, geography in Great Britain owes so much. I will only add one other remark, and that is, that it gives an additional charm to the medal, that it makes another link between me, however unworthy I may be, and the first explorer of Kangchenjanga, the illustrious Nestor of geographical science, Sir Joseph Hooker.

The PRESIDENT: Dr. Sven Hedin, the Victoria Medal of this Society, as perhaps you are aware, was instituted about two years ago for geographical research independent of travel; and you will understand, I hope, that it is conferred upon you exclusively for your merits in the researches you have undertaken. The Council considers that your work connected with the great plateau of Central Asia, and the Tarim valley, is of such importance that you have by that alone won for yourself a claim to our Victoria Medal. You have in a most remarkable way prepared yourself from your early youth to make these researches and to make them thoroughly. If it was necessary that you should know the history of a region in order to inquire into its geographical changes, you have studied that history exhaustively; if it was necessary that you should know the languages of the countries you visited, you studied and mastered those languages. In every department that it was necessary for you to gain knowledge, you made yourself a master, and in that way your researches became of great value. I take this opportunity of congratulating you on the grant that has been made you by the Swedish Parliament in order that your great labours may be satisfactorily utilized. The medal is granted not only for your work in the Tarim valley, but also for your remarkable researches, both historical and geographical, in elucidating the questions relating to the Lob region. These were the reasons which influenced our Council in selecting you for this honour. I have now great pleasure in placing the Victoria Medal in your hands.

Dr. SVEN HEDIN: May I express my deep gratitude for the great honour which has been bestowed upon me by the Royal Geographical Society, and for the kind words which you have addressed to me. I quite realize the high value and the great importance of this medal, which has been given away only once before, and which is regarded as an honour for geographical scientific work. I take it, the Council of the Royal Geographical Society regard this honour as an encouragement to go on on the same lines as I have gone before, and I shall try in the future to get some more materials and more knowledge of the geography of Central Asia. The time of adventurous journeys will soon be gone. We are just at the beginning of a new era in geographical science. During the three following years I hope I shall be able to show the results I have won during my last journey, and I hope the Council of the Royal Geographical Society will not have any cause to regret the great honour it has conferred upon me. I thank you, Sir Clements Markham, very much for the kind words you addressed to me concerning the grant I got from our Parliament, and by its aid I hope to be able to give to the world a very great publication with regard to the different materials collected during my journey—special maps, in an atlas of two volumes in folio and the text in five volumes. It will be published in English, as English is the language which is governing the world, and which will be understood by scholars and geographers in other countries. The part of Central Asia I have visited, I am sure will be of very great interest not only to geographers in England, but also to politicians. I express once more my deep gratitude.

The PRESIDENT: Baron Rammel (*Chargé d'Affaires* of Sweden and Norway), we had very great pleasure, when Captain Sverdrup was in England, in greeting him and hearing the account of his important discoveries in the Arctic Regions, and I then took the opportunity of delivering to him the Patron's Medal, which was awarded by the Council and received the approval of the King. We all, I can assure you, highly appreciate the importance of the discoveries made by Captain Sverdrup, and the admirable way in which he conducted his expedition. It is now my great pleasure to announce to you that one of our awards, the Murchison Award, has been given to one of Captain Sverdrup's principal followers, Captain Isachsen. Captain Isachsen is an excellent draftsman and a good surveyor, and he conducted his sledge journeys under the orders of Captain Sverdrup in a way which enabled him to make what to me was the most interesting part of the discoveries: that is to say, the discovery of the two large islands extending away to the westward beyond the meridian of the eastern coast of Melville Island. By this discovery, I consider that he filled up the last great gap in our knowledge of arctic geography. Captain Isachsen has selected a gold watch as the form that the award should take, and I now have great pleasure in requesting you to forward it to him.

Baron RAMMEL: On behalf of Captain Isachsen I beg to express his gratitude for the high distinction you have conferred upon him.

The PRESIDENT: The Gill Memorial has been given to Mr. Ellsworth Huntington for a very remarkable journey through the great cañon of the River Euphrate and the Cuthbert Peek Grant to Major Burdon for very useful route-maps i Northern Nigeria. Neither of those gentlemen are able to be present at th meeting. The Back Grant has been given to Dr. W. G. Smith for his investigations into the geographical distribution of vegetation in Yorkshire, a valuable, and I consider, most interesting paper.

The Presidential Address was then delivered (see p. 1).

Mr. Douglas W. Freshfield: I have been informed by my friend, Majo Darwin, your hon. secretary, that I must not introduce any contentious busines to this meeting. Perhaps he was thinking of ten years ago. But the business have to introduce cannot be considered as contentious in the slightest degree. I is to propose a vote of thanks to our President for the admirable address he ha just given us. There is a certain appropriateness in my doing it. One of my las acts as your secretary was to send a telegram to Sir Clements Markham in Sicily "Elected President; wire acceptance." I think it was my best act during m thirteen years of office. During the ten years that have since elapsed, he has give the Society not only his time, activity, and experience, but he has given somethin more: he has given to the Council of the Society enthusiasm—and even the bes of councils require enthusiasm. I hope he may be President for some time to come after our Antarctic anxieties are over, because we shall want his energy to assis in housing the Society in a new building, and I know no man who has such powe of getting money out of other people's unwilling pockets as Sir Clements Markham, and even of tackling a Chancellor of the Exchequer. And meantime w geographers, who have a liking, perhaps, for the air of the torrid or temperat zones, and prefer to take our snow and ice in more homœopathic doses, feel gratefu to Sir Clements Markham for the way in which he keeps an eye upon all parts c the globe from China to Peru, and yet finds time to assist in the important tas of bringing up the rising generation to a better knowledge of the world we liv in. I beg to propose a vote of thanks to Sir Clements Markham for his services.

Sir Thomas Holdich: I have very much pleasure in seconding Mr. Dougla Freshfield's proposal.

Sir Clements Markham in response said: It is a source of the greatest pleasur to me to receive the approbation of any assemblage of Fellows of this Society. Yo must all feel that I have been here a great deal too long in this chair. No one ha ever approached me except Sir Roderick Murchison, whom I have beaten now by year and a half. I should have asked to be allowed to retire before now, had it no been that I felt it absolutely necessary that I should see our gallant explorers in th south through the wood, before I go. There are many younger men who would d the work better than I can hope to do it in the future. But still I must say whe I retire from this chair I shall do so with regret, because of the kindness I hav always received from my associates, the Fellows of the Society.

The Report of Council was then read; it will be issued with the next edition o the Year Book.

The President then announced that the Council, as proposed, had been dul elected. The list is as follows, the names of new members, or of those changin office, being printed in *italics*:—

President: Sir Clements Markham, K.C.B., F.R.S., F.S.A. *Vice-Presidents* Colonel G. Earl Church; Colonel Sir Thomas Hungerford Holdich, R.E., K.C.I.E., C.B. *Lord Lamington, G.C.M.G.*; Admiral Sir F. Leopold McClintock, K.C.B., D.C.L. F.R.S.; Sir George S. Mackenzie, K.C.M.G., C.B.; Field-Marshal Sir Henry W Norman, G.C.B., G.C.M.G., C.I.E. *Treasurer:* Edward L. Somers Cocks. *Trustees* Right Hon. Lord Av [illegible] F.R.S.; Lord Belhaven and Stenton. *Honorar*

Secretaries: Major Leonard Darwin, R.E.; James F. Hughes. *Foreign Secretary:* Sir John Kirk, K.C.B., G.C.M.G., F.R.S. *Councillors: Admiral Sir Lewis A. Beaumont,* K.C.M.G.; Prof. T. G. Bonney, LL.D., F.R.S.; *Hon. George C. Brodrick,* D.C.L.; Admiral Sir James Bruce, K.C.M.G.; *J. Annan Bryce;* Sir H. E. G. Bulwer, G.C.M.G.; Prof. J. Norman Collie, F.R.S.; Colonel J. Cecil Dalton, R.A.; Prof. E. J. Garwood, F.G.S.; *Right Hon. Sir George D. T. Goldie,* K.C.M.G., F.R.S., D.C.L.; D. G. Hogarth; Colonel D. A. Johnston, R.E.; *Sir Harry H. Johnston,* G.C.M.G., K.C.B.; L. W. Longstaff; Howard Saunders, F.L.S.; *General J. H. M. Shaw Stewart,* R.E., F.R.S.E.; H. Yates Thompson, J.P.; Admiral Sir Richard E. Tracey, K.C.B.; Colonel J. K. Trotter, C.M.G., R.A.; Colonel Charles Moore Watson, R.E., C.B., C.M.G.; *Commander David Wilson-Barker,* R.N.R., Pres. R.M.S., F.R.S.E.

THE ANNUAL DINNER.

The Annual Dinner was held on the evening of the Anniversary, in the Whitehall Rooms, Sir Clements R. Markham, President, in the chair. Among those present were Lord Belhaven and Stenton, Lord Lamington, Mr. Justice Darling, the Dean of Westminster, Sir William Huggins, Field Marshall Sir Henry Norman, Admiral Sir Vesey Hamilton, Sir Harry Johnston, Sir Thomas Holdich, Hon. George C. Brodrick, Admiral Sir Lewis Beaumont, Sir George S. Mackenzie, Dr. Sven Hedin, Mr. Douglas W. Freshfield, Sir Henry Bulwer, the Astronomer Royal, Mr. Pember Reeves, Admiral Sir E. R. Fremantle, Admiral Sir James Bruce, Sir George Whitehouse, Mr. L. W. Longstaff, Prof. Thorpe, Prof. Ray Lankester, Hon. Alfred Dobson, General Shaw Stewart, Mr. R. Chalmers, Hon. W. E. Macartney, Colonel J. K. Trotter, Admiral Sir R. Tracey, Prof. Silvanus P. Thompson, General Sir Henry Smyth, Sir James Hayes Sadler, Mr. Julian Corbett, Mr. Grant Ogilvie, Mr. Alfred Sharpe, Mr. C. H. Read, Major L. Darwin, Mr. J. F. Hughes, Mr. E. L. S. Cocks.

After the toasts of "H.M. the King," Patron, and "H.R.H. the Prince of Wales," Vice-patron, the PRESIDENT proposed the toast of "The Medallists," which was responded to by Mr. DOUGLAS FRESHFIELD and Dr. SVEN HEDIN. The PRESIDENT next proposed "Success to the Antarctic Expedition." Major DARWIN proposed "The Guests," responded to by Sir WILLIAM HUGGINS and Mr. PEMBER REEVES. The toast of "The Staff" was proposed by the PRESIDENT, and responded to by the SECRETARY. Mr. EDMUND GOSSE proposed the toast of "The President and the Society," which was responded to by the PRESIDENT.

Thirteenth Ordinary Meeting, June 8, 1903.—Colonel G. EARL CHURCH, Vice-President, in the Chair.

ELECTIONS:—*Lieut. J. W. M. Ames, 5th Fusiliers; Dr. Ward Brinton; A. H. Whyte Butler, A.M. Inst. C.E.; Rev. H. S. Cronin; Henry Robert Conway Dobbs, I.C.S.; Alastair Macpherson Grant; William James Hoyten, M.R.C.S., L.R.C.P.; Arthur Albert Knight; Surgeon-Capt. John Smith Purdy, 6th N.Z.M.R.; Joseph Tucker; W. R. Spencer; Sir George Whitehouse, K.C.B.; Mervyn Williams.*

The Paper read was :—

"Journeys in Mongolia." By C. W. Campbell, C.M.G.

Fourteenth Ordinary Meeting, June 10, 1903.—Sir CLEMENTS MARKHAM, K.C.B., F.R.S., President, in the Chair.

The Paper read was:—

"The First Year's Work of the National Antarctic Expedition." By the President.

Fifteenth Ordinary Meeting, June 22, 1903.—Sir CLEMENTS MARKHAM, K.C.B., F.R.S., President, in the Chair.

ELECTIONS:—*Gerald James Frederick Adams; Granville Bevan; Herbert Fulford Bush; L. Hope Centeno; Thomas Herbert Davies, B.A.; Arthur Henry Dunning; Dr. P. Dwyer; Frank Flowers; H. S. Holt; J. J. Hubert Humphreys; Captain W. J. Johnston, R.E.; Wilfred Henry Jones, M.A.; Mark Jamestown Kelly; Richard Roope Linthorne; Walter R. Marley; Tyler Morse; William John Radford; Edward Robins, C.E.; Rev. Francis Henry Sprent; Lieut. Francis Maurice Collins Stokes; Albert B. B. de Tscharner; Lieut. W. H. Wilkin.*

The Paper read was:—

"Explorations in Bolivia." By Dr. Evans.

GEOGRAPHICAL LITERATURE OF THE MONTH.

Additions to the Library.

By EDWARD HEAWOOD, M.A., *Librarian*, R.G.S.

The following abbreviations of nouns and the adjectives derived from them are employed to indicate the source of articles from other publications. Geographical names are in each case written in full:—

A. = Academy, Academie, Akademie.
Abh. = Abhandlungen.
Ann. = Annals, Annales, Annalen.
B. = Bulletin, Bollettino, Boletim.
Com. = Commerce.
C. Rd. = Comptes Rendus.
Erdk. = Erdkunde.
G. = Geography, Geographie, Geografia.
Ges. = Gesellschaft.
I. = Institute, Institution.
Iz. = Izvestiya.
J. = Journal.
k. u. k. = kaiserlich und königlich.
.= Mitteilungen.
Mag. = Magazine.
Mem. = Memoirs, Mémoires.
Met. = Meteorological.
P. = Proceedings.
R. = Royal.
Rev. = Review, Revue.
S. = Society, Société, Selskab.
Sitzb. = Sitzungsbericht.
T. = Transactions.
V. = Verein.
Verb. = Verhandlungen.
W. = Wissenschaft, and compounds.
Z. = Zeitschrift.
Zap. = Zapiski.

On account of the ambiguity of the words *octavo*, *quarto*, etc., the size of books the list below is denoted by the length and breadth of the cover in inches to the neare half-inch. The size of the *Journal* is 10 × 6½.

A selection of the works in this list will be noticed elsewhere in the "Journal."

EUROPE.

Austria—Alps. *G. Abh.* 7 (1903): pp. 52. **Mülln**

Die Vereisung der österreichischen Alpenseen in den Wintern 1894–5 bis 1900–1. Von Prof. Dr. J. Müllner. *With Diagrams.*

Austria—Danube. *M. k.k. G. Ges. Wien* 46 (1903): 3–11. **Grab**

Geographisch-Geologisches aus dem oberösterreichischen Donautale. Von H. V. Graber.

Austria—Geodesy. ——

Publicationen für die Internationale Erdmessung. Die Astronomische-Geodätischen Arbeiten des K. und K. Militär-Geographischen Institutes in Wien. XIX. Band. Astronomische Arbeiten. 7. Polhöhen und Azimuth-Messungen auf den Stationen Ambrožny, Blažkov, Doubrava, Kamejk, Melechau (nur Polhöhe), Mezi vraty, Spálava, Spitzberg, Svidnik, Tok und Volini vrch. Herausgegeben vom K. und K. Militär-Geographischen Institute. Wien, 1902. Size 12 × 9½, pp. vi. and 216.

Austria—Istria. *Vierteljahrs. G. Unterricht* **2** (1903): 138–142. **Krebs.**

Wanderungen aus Istrien: Der Tschitschenboden. Von Dr. N. Krebs.

Balkan Peninsula. *G.Z.* **9** (1903): 149–160. **Philippson.**

Neuere Forschungen in der westlichen Balkanhalbinsel. Von Alfred Philippson.

Belgium—Coal. *Mém. S. Belge Géologie* **16** (1902): 77–120. **Stainier.**

Études sur le bassin houiller du Nord de la Belgique. Par X. Stainier. *With Map.*

Belgium—Manufactures. **Julin.**

Mém. Couronnés Acad. R. Sci. Belgique, Coll. 8°, **63** (1903): pp. 81.

Les Grandes Fabriques en Belgique vers le milieu du XVIIIe Siècle (1764). Par Armand Julin.

Belgium—Minerals. *Mém. S. Belge Géologie* **16** (1902): 1–15. **Stainier.**

Description des gîtes métallifères de la Belgique. Par X. Stainier. *With Plans.*

Bulgaria. *Meteorolog. Z.* **20** (1903): 97–107. **Ischirkoff and Kassner.**

Zum Klima von Sofia. I. Einige Notizen über die Lufttemperatur von Sofia. Von Dr. A. Ischirkoff.—II. Ueber den täglichen Gang der Temperatur zu Sofia. Von C. Kassner.—III. 10-Jährige Mittel von Sofia. Von A. Ischirkoff und C. Kassner.

Central Europe. **Ule.**

Niederschlag und Abfluss in Mitteleuropa. Von Prof. Dr. W. Ule. (Forschungen zur deutschen Landes- und Volkskunde . . . herausgegeben von Dr. A. Kirchhoff. Vierzehnter Band. Heft 5.) Stuttgart: J. Engelhorn, 1903. Size 9½ × 6½, pp. 435–516.

France—Coasts. *C. Rd.* **136** (1903): 1039–1043. **Depéret.**

Sur les anciennes lignes de rivage pliocènes et quaternaires sur les côtes françaises de la Méditerranée. Note de C. Depéret.

France—Dauphiné. *B.S.G. Lille* **39** (1903): 163–180. **Maquet.**

Le massif de l'Oisans. Par Maurice Maquet.

France—Ports. *B.S. Languedoc. G.* **25** (1902): 351–361, 465–476. **Bouchet.**

Les Ports Français. Par E. Bouchet.

Germany. **Ademeit.**

Beiträge zur Siedlungsgeographie des Unteren Moselgebietes. Von Dr. Wilhelm Ademeit. (Forschungen zur deutschen Landes- und Volkskunde . . . herausgegeben von Dr. A. Kirchhoff. Vierzehnter Band, Heft 4.) Stuttgart: J. Engelhorn, 1903. Size 9½ × 6½, pp. 335–434.

See note in Monthly Record (*ante*, p. 79).

Germany—Bavaria. *Jahresb. G. Ges. München* (1901–1902): 87–120. **Reindl.**

Die ehemaligen Weinkulturen in Südbayern. Eine geographisch-kulturgeschichtliche Skizze von Dr. J. Reindl. *With Illustrations.*

Germany—Limnology. *Jahresb. G. Ges. München* (1901–1902): 55–86. **Gebbing.**

Hydrochemische Untersuchungen des Würm-, Kochel- und Walchensees. Von J. Gebbing.

Germany—Mecklenburg. **Kaestner.**

Die Nordöstliche Heide Mecklenburgs nach ihrer geologischen Beschaffenheit und Entstehung. (Mitt. aus der Grossherzoglich Mecklenburg. Geol. Landesanstalt, xiii.) Inaugural-Dissertation von Alexander Kaestner. Rostock, 1901. Size 11½ × 9, pp. 26. *Map and Sections.*

See note in Monthly Record (*ante*, p. 80).

Germany—Prussia. *Petermanns M.* **49** (1903): 64–68. **Braun.**

Der Schilling-See im Preussischen Oberlande. Eine landeskundliche Studie. Von G. Braun. *With Map.*

Germany—Samland. **Jankowsky.**

Samland und Seine Bevölkerung . . . Von Rudolf Jankowsky. Königsberg i. Pr., 1902. Size 9 × 6, pp. 76. *Map.*

See note in Monthly Record (p. 80).

Germany—Thuringia. *Vierteljahrs. G. Unterricht* 2 (1903): 129–138. **Schomers.**

Ein geographischer Ausflug nach Thüringen. Von H. Schomers.

Greece—Eubœa. **Geyer.**

Quellen und Forschungen. zur alten Geschichte und Geographie. Heft 6. Topographie und Geschichte der Insel Euboia. I. Bis zum peloponesischen Kriege. Von Fritz Geyer. Berlin: Weidmann, 1903. Size 10 × 6½, pp. 124. *Price* 4*s.*

Holland. *Mém. S. Belge Géologie* 16 (1902): 129–153. **Lorié.**

Le Rhin et le glacier Scandinave quaternaire. Par le Dr. J. Lorié. *With Maps.*

Italy. *Riv. G. Italiana* 10 (1903): 169–179. **Malfatti.**

Sulla necessità di una Geografia dell' Italia medievale. Memoria postuma del Prof. B. Malfatti.

Italy—Bibliography. *Riv. G. Italiana* 9 (1902): pp. 45. **Magistris.**

Bibliografia Geografica della Regione italiana. Anno i. 1901. Rassegna di L. F. De Magistris.

Italy—Florence. **Hyett.**

Florence, Her History and Art, to the Fall of the Republic. By Francis A. Hyett. London: Methuen & Co., 1903. Size 9 × 5½, pp. xxxii. and 600. *Price* 7*s.* 6*d. net. Presented by the Publishers.*

Italy—Hydrology. *Riv. G. Italiana* (1902): 619–630; 10 (1903): 21–44. **Bertolini.**

Ancora della linea delle sorgive in relazione alle lagune e al territorio veneto. Del prof. G. L. Bertolini.

Italy—Rivers and Glaciers. *Riv. G. Italiana* 10 (1903): 146–151. **Marinelli.**

I ghiacciai nel regime dei fiumi alpini secondo una memoria dell' Ing. Gaudenzio Fantoli. O. Marinelli.

See note in Monthly Record (p. 90).

Italy—Terminology. *Riv. G. Italiana* 10 (1903): 45–53. **Crocioni.**

Termini geografici dialettali di Velletri e dintorni raccolti da G. Crocioni.

Italy—Tuscany. *Riv. G. Italiana* 10 (1903): 201–208. **Dainelli.**

Le osservazioni fisiche in Toscana di Pier Antonio Micheli per il Dott. G. Dainelli.

Micheli was born in Florence in 1679, and died in 1737.

Mediterranean—Crete. **Chalikiopoulos.**

Sitia, die Osthalbinsel Kreta's. Eine geographische Studie von Dr. phil. L. Chalikiopoulos. (Veröffentlichungen des Instituts für Meereskunde und des Geographischen Instituts an der Universität Berlin, Heft 4.) Berlin: E. S. Mittler & Sohn, 1903. Size 10½ × 7, pp. viii. and 138. *Maps and Illustrations. Price* 5*s.*

Mediterranean—Crete. ———

The Cretan Exploration Fund. [Report, 1902.] Size 9½ × 7½, pp. 8. *Sketch-map.*

United Kingdom—Cornwall. **Hull.**

The Cheesewring, Cornwall, and its Teachings. By Prof. Edward Hull, F.R.S., etc. (A Paper read before the Victoria Institute, February 16, 1903.) Size 8½ × 5½, pp. 16. *Illustrations. Presented by the Author.*

The "Cheesewring" is a remarkable pile of rock near Liskeard.

United Kingdom—England. **Milne.**

The Gentleman's Magazine Library: being a Classified Collection of the chief contents of the *Gentleman's Magazine* from 1731 to 1868. Edited by George Laurence Gomme. English Topography. Edited by F. A. Milne. Part x. Shropshire—Somersetshire (pp. xiv. and 350); Part xi. Staffordshire—Suffolk (pp. xiv. and 328); Part xii. Surrey—Sussex (pp. xiv. and 382); Part xiii. Warwickshire—Westmoreland—Wiltshire (pp. xii. and 388); Part xiv. Worcestershire—Yorkshire (pp. xii. and 418). London: E. Stock, 1898–1902. Size 9 × 5½. *Price* 7*s.* 6*d. per vol.*

United Kingdom—Falmouth. **Gay.**

Old Falmouth. The Story of the Town from the days of the Killigrews to the Earliest Part of the 19th Century. By Susan E. Gay. London: Headley Bros., 1903. Size 9 × 5½, pp. xiv. and 260. *Map and Illustrations. Price 7s. 6d.*

United Kingdom—London. *Quarterly Rev.* **197** (1903): 252–269. ——

The Port of London.

United Kingdom—Trade. **Popescu.**

Wirtschaftsgeographische Studien aus Grossbritannien. Von S. D. Popescu. Leipzig: O. Schmidt, 1903. Size 9 × 6, pp. 178. *Presented by the Author.*

United Kingdom—Yorkshire. **Baddeley.**

Thorough Guide Series. Yorkshire (Part i.). The East Coast, York, and the Country between the N.E. Main Line and the Sea; also the Cathedral and Castle of Durham. By M. J. B. Baddeley. Fourth Edition, Revised. London: Dulau & Co., 1902. Size 6½ × 4½, pp. xvi. and 142. *Maps and Plans. Price 2s. 6d. Presented by the Publishers.*

Special attention has been paid in this edition to the requirements of cyclists, and there are additions in other directions also.

ASIA.

Arabia. *Rev. G.* **52** (1903): 123–134, 250–263. **Barré.**

L'Arabie. Par P. Barré. *With Map.*

Caspian Sea. *Meteorolog. Z.* **20** (1903): 54–57. **Woeikof.**

Die Resultate der Karaboghaz-Expedition. Von A. Woeikof.

Ceylon. *Nature* **67** (1903): 620–622. **Herdman.**

The Pearl Fisheries of Ceylon. By Prof. W. A. Herdman, F.R.S.

China. *Army Medical Dept. Rep.* **43** (1901): 381–410. ——

Report on the Medical History of the Campaign, China Field Force, 1900–1901.

China—Geographical Names. *Ta-Ssi-Yang-Kuo* **1** (1899–1900): 43–52. ——

Denominações dadas pelos chinezes ao seu paiz, ao Japão e aos principaes paizes europeus, etc.

China—Great Wall. **Black.**

The Great Wall of China. By C. E. D. Black. [From the *Calcutta Review* for January, 1903.] Size 9 × 5½, pp. 12. [See note in Monthly Record.]

China—Macao. **Da Gama.**

Ta-Ssi-Yang-Kuo **1** (1899–1900): 31–41, 113–119, 181–188, 305–310; **2** (1900–1901): 693–702, 747–763.

Uma resurreição historica. (Paginas inéditas d'um visitador dos jesuitas [Luiz da Gama]) (1665–1671).

China—Macao. ——

Ta-Ssi-Yang-Kuo **1** (1899–1900): 213–223, 369–380; **2** (1900–1901): 411–435.

As fortalezas de Macau. *With Illustrations.*

China—Mongolia. *Jahresb. G. Ges. München* (1901–1902): 1–40. **Stauffenberg.**

Ein Ritt durch die östliche Mongolei. Von Werner Schenk Freiherrn von Stauffenberg. *With Illustrations.*

China—Pechili. *Jahresb. G. Ges. München* (1901–1902): xxxvi.–xli. **Kübel.**

Drei Monate an der Westgrenze von Petschili. Von Oberleutnant Kübel.

China and Persia. *Imp. and Asiatic Quarterly Rev.* **15** (1903): 144–169. **Parker.**

Chinese Knowledge of Early Persia. By E. H. Parker.

French Indo-China. *Rev. G.* **52** (1903): 200–224, 318–344. **Ibos.**

L'Indo-Chine française. Par Capitaine Ibos. *With Map.*

India—Bengal. **Mullick.**

History of the Vaisyas of Bengal. By Promatha Nath Mullick. Calcutta, 1902. Size 7½ × 5, pp. iv. and 190. *Two Copies presented by the Author.*

India—Botany. **Prain.**

Report of the Director of the Botanical Survey of India [David Prain] for the year 1901–1902.

India—Central Provinces. **Walker.**
Mem. Geolog. Surv. India **33** (Pt. 3) (1902): pp. 22.
The Geology of Kalahandi State, Central Provinces. By T. L. Walker. *With Map and Plate.*

India—Diu. **Nunes.**
Ta-Ssi-Yang-Kuo 1 (1899–1900): 381–388; **2** (1900–1901): 437–442, 493–497, 553–560, 631–637, 683–692; **3** (1902): 22–30, 76–83, 138–146, 202–209, 286–297.
Diu (excerptos d'um livro inédito). A Pereira Nunes. *With Illustrations.*

India—Laterite. *Geolog. Mag.* **10** (1903): 154–159. **Warth.**
The Composition of Indian Laterite. By H. Warth and F. J. Warth.

India and Persia. *J.E. India Assoc.* **34** (1903): 12–39. **Rees.**
Russia, India, and the Persian Gulf, or the Western Frontiers of India. By J. D. Rees.

Malay Archipelago—Sumatra. **Otto.**
Pflanzer- und Jägerleben auf Sumatra. Von Eduard Otto. Berlin: W. Süsserott, 1903. Size 8½ × 5½, pp. 186. *Illustrations. Price* 8*s.*

Malay Peninsula—Tin. *J. Geology* **11** (1903): 135–154. **Penrose.**
The Tin Deposits of the Malay Peninsula, with special reference to those of the Kinta District. By R. A. F. Penrose, junr. *With Map and Illustrations.*

Persia. *Petermanns M.* **49** (1903): 60–64. **Stahl.**
Von der kaukasischen Grenze nach Tabriz und Kaswin. Von A. F. Stahl. *With Map.*

Persia—Kermanshah. **Rabino.**
Trade and General Condition of the City and Province of Kermanshah. Foreign Office, Miscellaneous, No. 590, 1903. Size 9½ × 6, pp. 76. *Price* 4*d.*

Philippine Islands. *National G. Mag.* **14** (1903): 185–195.
The Conquest of Bubonic Plague in the Philippines. *With Illustrations.*

Russia. **Wright.**
Asiatic Russia. By George Frederick Wright. Two vols. London: E. Nash; New York: McClure, Phillips & Co. 1903. Size 9½ × 6, pp. xxii., 638, and xii. *Maps and Illustrations. Price* £1 12*s.*

Russia—Caucasus. **Loewinson-Lessing.**
Materialien Geologie Russlands **21** (1903): 108–119.
Geologisch-petrographische Untersuchungen im Bereich des Massivs und der Ausläufer des Kasbek im Jahre 1899. Von F. Loewinson-Lessing. [In Russian. *Résumé* in German.] *With Plates.*

Russia—Caucasus. **Radde.**
Die Sammlungen des Kaukasischen Museums im Vereine mit Special-Gelehrten bearbeitet und herausgegeben von Dr. G. Radde. Band ii. Botanik. Von Dr. G. Radde. Tiflis, 1901. Size 12½ × 9, pp. x., 102, and 202. *Maps and Plates.*

Russia—Eastern Siberia. **Mikhailovsky.**
Trav. Sous-Sect. Troitzkossawsk.-Kiakhta S. Imp. Russe G. **3**, 1900 (1902): 63–130.
Troitzkossawsk et les faubourgs Kiakhta et Oust-Kiakhta sous le rapport sanitaire et économique. Par I. P. Michailowsky. [In Russian.]

Russia—Eastern Siberia. *B.S.G. Com. Paris* **24** (1902): 565–570. **Labbé.**
En Asie russe et en Extrême-Orient. Par P. Labbé.

Russia—Sakhalin. *Scottish G. Mag.* **19** (1903): 183–190. **Hawes.**
A Visit to the Island of Sakhalin. By C. H. Hawes. *With Illustrations.*

Russia—Siberia. **Meister and Izhitzky.**
Explorations géologiques dans les Régions aurifères de la Sibérie. Région aurifére d'Iénisséi. Livr. iii. Bassin de la Tatarka. Par A. Meister. Explorations géologiques dans les bassins des rivières Pit, Gorbylok, Oudéréi. Par N. Izhitzky.

Russia and Persia. **Krahmer.**
Russland in Asien. Band. vi. Die Beziehungen Russlands zu Persien von Krahmer. Leipzig: Zuckschwerdt & Co., 1903. Size 9½ × 6½, pp. 126. *Price* 3*s.*

Russian Central Asia. *B.S.G. Com. Paris* **24** (1902): 551–564. **Levat.**
Une Egypte russe. Turkestan et Boukharie. Par D. Levat.

Russian Central Asia. *Deutsch. Rundschau G.* **25** (1903): 306–318. **Orlovsky.**
Ein mächtiges Gebiet, welches durch Irrigation kultiviert werden soll. Von J. v. Orlowsky. *With Map.*

Turkey. **Willcocks.**
The Restoration of the Ancient Irrigation Works on the Tigris, or the Re-creation of Chaldea. By Sir William Willcocks. Cairo. 1903. Size 9½ × 6½, pp. 72. *Maps and Illustrations. Presented by the Author.*

Turkey—Asia Minor. *Globus* **83** (1903): 165–169, 186–191. **Ruge.**
Kleinasien als Wiege der wissenschaftlichen Erdkunde. Von S. Ruge.

AFRICA.

Abyssinia—Frontiers. *Rev. G.* **52** (1903): 308–317. **Rouire.**
L'Éthiopie, l'Angleterre et l'Italie; les derniers traités anglo-italo-éthiopiens. Par M. Rouire.

Abyssinia—Historical. **Castanhoso and Whiteway.**
The Portuguese Expedition to Abyssinia in 1541–1543, as narrated by Castanhoso, with some Contemporary Letters, the Short Account of Bermudez, and Certain Extracts from Correa. Translated and edited by R. S. Whiteway. London: Hakluyt Society, 1902. Size 9 × 5½, pp. cxxxii. and 296. *Map and Illustrations. Presented by the Hakluyt Society.*

Africa. *Globus* **83** (1903): 197–199. **Singer.**
Die deutsche Afrikaforschung. Von H. Singer.

Algeria. **Claparède.**
Le XXIIIe Congrès Gèographique français et le Millénaire de la Ville d'Oran. Par Arthur de Claparède. Geneva, 1902. Size 7½ × 5, pp. 37.

British East Africa. **Arkell-Hardwick.**
An Ivory Trader in North Kenia. The Record of an Expedition through Kikuyu to Galla-Land in East Equatorial Africa, with an account of the Rendili and Burkeneji Tribes. By A. Arkell-Hardwick. London, etc.: Longmans, Green & Co., 1903. Size 9 × 5½, pp. xvi. and 368. *Map and Illustrations. Price* 12*s.* 6*d. net. Presented by the Publishers.*

British East Africa. **Whyte.**
Africa, No. **3** (1903). Report by Mr. A. Whyte on his recent travels along the sea-coast belt of the British East Africa Protectorate. London, 1903. Size 13 × 8½, pp. 18. *Plates. Price* 8½*d.*
Noticed in the Monthly Record (p. 83).

Cape Colony. **Kilpin.**
The Cape of Good Hope Civil Service List, 1903; containing the Official Return of the Civil and Military Establishments of the Colony, Pension Lists, Acts and Regulations, Service and Duties of Officers, Particulars of the Government and Parliament, Local Boards and Courts, etc., also the Civil Service Calendar, 1903, containing all Matters connected with the Examinations for entry into the Service, and the Civil Service Law Examinations. Edited by E. F. Kilpin. Cape Town: W. A. Richards & Sons, 1903. Size 9 × 5½, pp. xlviii. and 464. *Map.*

Congo-Navigation. *B.S.G. Marseille* **26** (1902): 450–455. **Berthier.**
La Navigation fluviale au Congo. Par L. C. Berthier.

Egypt. *Jahresb. G. Ges. München* (1901–1902): xxx.–xxxii. **Steindorff.**
Reise von Kairo durch die libysche Wüste zur Ammons-Oase. Von G. Steindorff.

Egypt-Nile. *Popular Sci. Monthly* **62** (1903): 550–561. **Baker.**
The Nile Dams and Reservoir. By Sir B. Baker. *With Illustrations.*

Egypt and the Sudan. ——
Egypt. No. 1 (1902). Reports by His Majesty's Agent and Consul-General on the Finances, Administration, and condition of Egypt and the Soudan in 1901. London: Eyre and Spottiswoode, 1902. Size 13½ × 8½, pp. iv. and 80. *Price* 8½*d.*

Egypt. No. 1 (1903). Ditto in 1902. London: Eyre & Spottiswoode, 1903. Size 13½ × 8½, pp. iv. and 98. *Price* 10*d.* [See p. 82.]

Egyptian Sudan. *Mouvement G.* 20 (1903): 175–182, 187–191, 199–204. **Wauters.**
Les Territoires pris à bail du Haut Nil. Par A. J. Wauters. *Maps.*

French Congo. *Rev. Colon.* (1903): 403–406. **Coupé.**
Reconnaissances faites dans la région de Bangui du 6 juin au 25 août 1902. Par M. Coupé. *With Map.*

French Guinea. *Rev. Colon.* (1903): 373–386. **Bouchez.**
Région du Labbé. Rapport du capitaine Bouchez.

French Guinea. *Rev. Colon.* (1903): 389–400. **Gauthier.**
Cercle du Rio Nunez. Rapport de M. Gauthier. *With Map.*

French West Africa. **Thomann.**
Renseignements Colon., *Comité l'Afrique Française* (1903): 1–13, 98–104, 121–135.
De la Côte d'Ivoire au Soudan français, la mission Thomann. *With Map.*

Niger. *Tour du Monde* 9 (1903): 1–96. **Lenfant.**
Le Niger, voie ouverte a notre empire Africain. Par le Capitaine Lenfant. *With Maps and Illustrations.*

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Portuguese East Africa—Pearl Fishery. *B.S.G. Lisboa* 21 (1903): 1–20. **Ferraz.**
As perolas e a sua pesca em Moçambique. Por I. Ferraz.

Rhodesia. ———
The British South Africa Company. Reports on the Administration of Rhodesia, 1900–1902. With Appendix. Size 10½ × 8½, pp. 474; Appendix, 124. *Maps. Presented by the British South Africa Company.*

Rhodesia. ———
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Sahara. *A travers le Monde, Tour du Monde* 9 (1903): 89–92. **Dex.**
L'Expédition aérostatique du Sahara. Par Léo Dex. *With Map and Illustrations.*

Sahara. **Taillis.**
A travers le Monde, Tour du Monde 9 (1903): 57–60, 65–68, 73–76, 97–100.
Le Transsaharien est-il possible? Par J. du Taillis. *With Map and Illustrations.*

South Africa. **Béguin**
Les Ma-rotsé. Étude géographique et ethnographique du Haut Zambèze. Par Eugène Béguin. Lausanne and Fontaines: E. Sack, 1903. Size 7½ × 5, pp. 156. *Price* 2*s.*

The author has worked as a missionary for seven years in Basotseland.

West Africa. *Rev. Colon.* (1902): 249–278. **Duboc.**
La Mission du Golfe de Guinée. Par le lieutenant Duboc.

On ethnological observations made during the work of the Franco-Spanish delimitation commission in the Corisco bay region.

West Africa. **Schanz.**
West-Afrika. Von Moritz Schanz. Berlin: W. Süsserott, 1903. Size 10 × 7, pp. vi and 416. *Price* 6*m. Presented by the Publisher.*

NORTH AMERICA.

Alaska. *National G. Mag.* 14 (1903): 99–106. **Emerson.**
Opening of the Alaskan Territory. By H. Emerson. *With Illustrations.*

Alaska. *National G. Mag.* 14 (1903): 91–99. **Westdahl.**
Mountains on Unimak Island, Alaska. By F. Westdahl. *With Map and Illustrations.*

America. *Rev. G.* **52** (1903): 1–21, 101–122, 225–242. **Brisse.**
Les intérêts allemands en Amérique. Par A. Brisse. *With Map.*

Canada. *Fortnightly Rev.* **73** (1903): 412–423. **Church.**
Canada and its Trade Routes. By Colonel G. E. Church. *With Map.*

Canada—New Brunswick. *B. Nat. Hist. S. New Brunswick* **5** (1903): 90–101. **Bailey.**
Notes on the Highlands of Northern New Brunswick. By L. W. Bailey.

Canada—New Brunswick. *B. Nat. Hist. S. New Brunswick* **5** (1903): 35–92. **Ganong.**
Notes on the Natural History and Physiography of New Brunswick. By W. F. Ganong. *With Maps.*

Canada—New Brunswick. *B. Nat. Hist. S. New Brunswick* **5** (1903): 5–14. **Stead.**
Notes on Surface Geology of New Brunswick. By G. Stead.

Canada and United States. *National G. Mag.* **14** (1903): 85–90. **Foster.**
The Canadian Boundary. By Hon. J. W. Foster. *With Map.*

North America—Glacial Epoch. *J.G.* **2** (1903): 21–25. **Whitbeck.**
The Glacial Period and Modern Geography. By R. H. Whitbeck.

Traces the influence of the glacial period on the physical, and consequently on the economic, geography of North America.

North America—Historical. **Thwaites.**
The Jesuit Relations and Allied Documents. Travels and Explorations of the Jesuit Missionaries in New France, 1610–1791. The Original French, Latin, and Italian Texts, with English Translations and Notes. Edited by Reuben Gold Thwaites. 73 vols. Cleveland: The Burrows Bros. Co., 1896–1901. Size 9½ × 6. *Portraits, Maps, and Facsimiles.*

United States. *National G. Mag.* **14** (1903): 171–185. **Adams.**
The United States—Land and Waters. By Cyrus C. Adams. *With Map and Illustrations.*

United States. *J.G.* **2** (1903): 40–45. **Raymond.**
Geographical Positions of the Base Lines and Principal Meridians governing the Public Surveys. By W. G. Raymond.

United States—California. *American J. Sci.* **15** (1903): 342–362. **Diller.**
Klamath Mountain Section, California. By J. S. Diller.

United States—California. *J. Geology* 11 (1903): 155–165. **Hershey.**
The Sierran Valleys of the Klamath Region, California. By O. H. Hershey.

United States—Census. ———
Twelfth Census of the United States. William R. Merriam, Director. Bulletins, Nos. 1–232. Washington, 1901–02.

The agriculture, manufactures, etc., of each state are dealt with in separate bulletins.

United States—Meteorology. *Monthly Weather Rev.* **30** (1902): 482–485. **Murdoch.**
Cycles of precipitation. By L. H. Murdoch. *With Diagram.*

Discusses the relation existing between rainfall and the level of the Great Salt Lake.

United States—Ohio. *J. Geology* **10** (1902): 822–838. **Bownocker.**
The Oil- and Gas-producing Rocks of Ohio. By J. A. Bownocker.

United States—South Carolina. **Jesunofsky.**
Monthly Weather Rev. **30** (1902): 479–481.
Some peculiarities in frost formation over the coast region of South Carolina. By L. N. Jesunofsky.

United States—Trade Route. **Benton.**
The Wabash Trade Route in the Development of the Old North-west. By E. J. Benton. (Johns Hopkins University Studies. Series xxi. Nos. 1–2.) Baltimore, 1903. Size 9½ × 6½, pp. 112.

United States—Utah. **Huntington and Goldthwait.**
The Hurricane Fault in South-western Utah. By E. Huntington and J. W. Goldthwait. (Reprinted from the *Journal of Geology*, vol. xi. No. 1, January–February, 1903.) Chicago. Size 10 × 7, pp. 46–63. *Sketch-map and Illustrations. Presented by Mr. E. Huntingdon.*

Egyptian Sudan. *Mouvement G.* 20 (1903): 175–182, 187–191, 199–204. **Wauters.**
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West-Afrika. Von Moritz Schanz. Berlin: W. Süsserott, 1903. Size 10 × 7, pp. vi. and 416. *Price* 6*m. Presented by the Publisher.*

NORTH AMERICA.

Alaska. *National G. Mag.* 14 (1903): 99–106. **Emerson.**
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Alaska. *National G. Mag.* 14 (1903): 91–99. **Westdahl.**
Mountains on Unimak Island, Alaska. By F. Westdahl. *With Map and Illustrations.*

CENTRAL AND SOUTH AMERICA.

Antigua. *W. Indian B.* 3 (1902): 362–372. ——
The Climatology of Antigua.

Argentine-Chilean Boundary. *Globus* 83 (1903): 199–201. **Hauthal.**
Die Entscheidung im argentinisch-chilenischen Grenzstreit. Von R. Hauthal. *With Map.*

Argentine-Chilean Boundary. *G.Z.* 9 (1903): 160–164. **Stange.**
Die Regelund des argentinisch-chilenischen Grenzstreites. Von Dr. P. Stange. *Map.*

Barbados—Volcanic Dust. *West Indian B.* 4 (1903): 92–100. ——
Notes on Fall of Volcanic Dust at Barbados, March 22, 1903.

Bolivia. ——
El territorio Nacional de Colonias. La Paz, 1903. Size 9 × 6½, pp. 54. *Map.*
The map shows the land and water routes which give access to the territory.

Brazil—Amazon. *B. Museu Paraense* 3 (1902): 370–399. **Gœldi.**
Maravilhas da natureza na Ilha de Marajó. Pelo Dr. E. A. Goeldi. *With Illustrations.*
Sketches of the fauna and flora of Marajo.

Brazil—Amazon. *B. Museu Paraense* 3 (1902): 447–498. **Huber.**
Contribuição á geographia physica dos furos de Breves e da parte occidental de Marajó. Pelo Dr. J. Huber. *With Maps and Illustrations.*
Will be noticed in the Monthly Record.

Brazil—Zoology. **Gœldi.**
Estudos sobre o desenvolvimento da Armaçao dos Veados galheiro do Brazil (*Cervus paludosus, C. Campestris, C. Wiegmanni*). Pelo Prof. Dr. Emilio A. Goeldi. (Memorias do Museu Goeldi, iii.) Rio de Janeiro, 1902. Size 13 × 9½, pp. 46. *Plate.*

Central America—Earthquakes. *P.R.S.* 71 (1903): 403–404. **Hay.**
On Central American Earthquakes, particularly the Earthquake of 1838. By Admiral Sir J. D. Hay.

Chile. *Meteorolog. Z.* 20 (1903): 114–122. **Martin.**
Zum Klima von Südchile, Llanquihue und Chiloé. Von Dr. C. Martin.

Colombia. **Uribe.**
Anales diplomaticos y consulares de Colombia. Publicados bajo la dirección del Dr. Antonio Jose Uribe. Tom. 2. Bogota, Imprenta national, 1901. Size 9½ × 6½, pp. 981 and lxxxi. *Presented by the Editor.*

Colombia. **Uribe.**
Anales diplomaticos y consulares de Columbia. Publicados bajo la direccion del Dr. A. J. Uribe. Tome Segundo. Bogota, 1901. Size 9½ × 6½, pp. 982 and lxxxii. *Presented by Dr. A. J. Uribe.*

Colombia—Panama. *Globus* 83 (1903): 247–253. **Sapper.**
Eine Reise über den Isthmus von Panamá. Von Karl Sapper. *With Illustrations.*

Cuba. *Tour du Monde* 9 (1903): 109–132. **Guerlac.**
Cuba sous l'Administration Américaine. Par O. Guerlac. *With Illustrations.*

Falkland Islands. **Melvill.**
Mem. and P. Manchester Lit. and Philosoph. S. 47 (1903) (x.): pp. 8.
Report on the Plants obtained by Mr. Rupert Vallentin in the Falkland Islands, 1901–1902. By J. Cosmo Melvill.

Falkland Islands and Tierra del Fuego. *Petermanns M.* 49 (1903): 33–34. **Andersson.**
Die wissenschaftlichen Arbeiten der schwedischen Südpolar-Expedition auf den Falkland-Inseln und im Feuerland. Von H. G. Andersson.

Peru. **Plane.**
À travers l'Amerique Équatoriale. Le Pérou, par Auguste Plane. Deuxième édition. Paris: Plon-Nourrit et Cie., 1903. Size 7½ × 4, pp. iii. and 340. *Maps and Plates. Price 4 fr. Presented by the Author.*

South America. *Questions Dipl. et Colon.* **15** (1903): 497–503. **Jadot.**
Le contesté boliviano-brésilien: le territoire de l'Acre. Par L. Jadot. *With Maps.*

South America—Orthography. *Globus* **83** (1903): 170–171. **Sievers.**
Zur Schreibweise der Orts- und Stammes-namen in Südamerika. Von Prof. W. Sievers.

Uruguay. *B.S.G. Com. Paris* **24** (1902): 539–550. **Wiener.**
L'Uruguay au point de vue économique. Par C. Wiener.

West Indies—Sailing Directions. **Barnett.**
The West India Pilot. Vol. i. From Cape Orange in Brazil to Cape Sable in Florida, with the adjacent islands. Originally compiled by Captain E. Barnett. Sixth Edition. London, 1903. Size 9½ × 6, pp. xxii. and 642. *Map. Price* 4*s.* 6*d.* *Presented by the Hydrographer, Admiralty.*

AUSTRALASIA AND PACIFIC ISLANDS.

Australia—Discovery. *Ta-Ssi-Yang-Kuo* **2** (1900–1901): 661–666. **Pimentel.**
Duas palavras sobre a descoberta da Australia em 1601 pelos portuguezes. Jayme Pereira de Sampaio Forjaz de Serpa Pimentel.

New Guinea—British. ——
Annual Report on British New Guinea from July 1, 1900, to June 30, 1901; with Appendices. Brisbane, 1902. Size 13½ × 8½, pp. l. and 196. *Maps and Plates.*

See note in the *Journal* for May (p. 558).

New South Wales. *P.R.S. Queensland* **17** (1903): 71–96. **Norton.**
New England (N.S.W.). Reminiscences during the Fifties. By the Hon. A. Norton.

Pacific Coal. *Engineering Mag.* **23** (1902): 161–182. **Emerson.**
The Coal Resources of the Pacific. By Harrington Emerson. *With Illustrations.*

Pacific—German Possessions. **Wegener.**
Deutschland in Stillen Ozean. (Samoa, Karolinen, Marshall-Inseln, Marianen, Kaiser-Wilhelms-Land, Bismarck-Archipel und Salomo-Inseln. Von Georg Wegener (Land und Leute. Monographien zur Erdkunde, xv.). Bielefeld und Leipzig: Velhagen and Klasing, 1903. Size 10½ × 7, pp. 156. *Map and Illustrations. Price* 4*m.* *Presented by the Publishers.*

Pacific—Mariannes. *Ann. Hydrographie* **31** (1903): 139–144. **Seidel.**
Klima und Wetter auf den Marianen. Van H. Seidel.

Queensland. *P.R.S. Queensland* **17** (1903): 147–160. **Norton.**
Settling in Queensland and the reasons for doing so, with special reference to Droughts. By the Hon. A. Norton.

Queensland—Cape York Peninsula. **Jackson.**
Queensland Gov. Mining J. **4** (1903): 10–15.
West Coast of Cape York Peninsula and Horn Island and Possession Island Goldfields. By C. F. V. Jackson. *Map and Illustrations.*

Samoa—Savaii. *Z. Ges. Erdk. Berlin* (1903): 208–219. **Wegener.**
Die vulkanischen Ausbrüche auf Sawaii. Von Dr. G. Wegener. *With Map and Illustrations.*

Solomon Islands. *Globus* **83** (1903): 181–186. **Seidel.**
Die deutschen Salomo-Inseln sonst und jetzt. Von H. Seidel. *With Map.*

South Australia. *T.R.S.S. Australia* **26** (1902): 268–277. **Greenway and Phillipps.**
Notes on the Geological Features of Southern Yorke Peninsula. By T. C. Greenway and H. T. Phillipps. *With Section.*

POLAR REGIONS.

Arctic—"Polar Star." **Abruzzi, Cagni, Molinelli, and Le Queux.**
On the *Polar Star* in the Arctic Sea. By His Royal Highness Luigi Amedeo of Savoy, Duke of the Abruzzi, with the statements of Commander M. Cagni upon

the Sledge Expedition to 86° 34′ North, and of Dr. A. Cavalli Molinelli upon his return to the Bay of Teplitz. Translated by William Le Queux. In Two Volumes. London: Hutchinson & Co., 1903. Size 10 × 7½, pp. xvi. 702, and xii. *Price* 42*s. net. Presented by the Publishers.*

See review in the May *Journal.*

MATHEMATICAL GEOGRAPHY.

Areas. *G.Z.* 9 (1903): 167–168. **Früh.**

Zur Bestimmung der Oberflächenentwicklung. Von Prof. Dr. J. Früh.

Cartography—Map Collection. *G.Z.* 9 (1903): 164–165. **Hantzsch.**

Die Kartensammlung der königl. Bibliothek zu Dresden. Von Dr. Victor Hantzsch.

Compass—Historical. *Riv. G. Italiana* 10 (1903): 1–11, 105–122. **Bertelli.**

La leggenda di Flavio Gioia inventore della Bussola. A proposito di un articolo del Prof. F. Porena, osservazioni del P. T. Bertelli. *Also separate copy, presented by the Author.*

Geodesy. **Albrecht.**

Centralbureau der Internationalen Erdmessung. Neue Folge der voröffentlichungen, No. 8. Resultate des Internationalen Breitendienstes. Band i. Von Th. Albrecht. Berlin: G. Reimer, 1903. Size 11½ × 9, pp. 174. *Maps, Plans, and Plates.*

Geodesy—Instruments. *Sci. T.R. Dublin S.* 7 (Ser. ii.) (1902): 385-390. **Grubb**

Some new forms of Geodetical Instruments. By Sir Howard Grubb. *Plate.*

PHYSICAL AND BIOLOGICAL GEOGRAPHY.

Climatology. **Hann and Ward.**

Handbook of Climatology. By Dr. Julius Hann. Translated with the Author's permission from the Second Revised and Enlarged German Edition, with additional references and notes, by Robert de Courcy Ward. New York and London: Macmillan & Co., 1903. Size 9½ × 6, pp. xiv. and 438. *Diagrams. Price* 12*s.* 6*d. net. Presented by the Publishers.* [See review, *ante*, p. 75.]

Coral Reefs. *P.R.S.* 71 (1903): 412–414. **Agassiz.**

On the Formation of Barrier Reefs and of the Different Types of Atolls. By A. Agassiz.

See note in the Monthly Record (p. 89).

Crust of the Earth. *B.S. Belge Géologie* 16 (1902): 594–602. **Van den Broeck.**

Quelques remarques à propos des vues de M. le Dr. A. Stübel sur la genèse et la structure de l'écorce solide du globe et des conséquences géologiques de cette thèse. Par E. Van den Broeck.

Geology—Bibliography. ——

International Catalogue of Scientific Literature. First Annual Issue. H. Geology. Published for the International Council by the Royal Society of London. London: Harrison & Sons, 1903. Size 9 × 5½, pp. xiv. and 220. *Price* 15*s.*

Glacial Epoch. *Naturw. Wochenschrift* 2 (1903): 301–305. **Wolff.**

Zur Kritik der Interglacial-Hypothese. Von Dr. W. Wolff.

Glaciers. **Finsterwalder and Muret.**

Commission Internationale des Glaciers. Les Variations Périodiques des Glaciers. Septième Rapport, 1901, rédigé par le Dr. Finsterwalder et E. Muret. (Extrait des Archives des Sciences physique et naturelles, t. xiv., 1902.) Geneva, 1902. Size 9 × 6, pp. 21.

Glaciers. *Jahresb. G. Ges. München* (1901–1902): 41–54. **Günther.**

Pencks neue Glazialstudien. Von S. Günther.

Gravity. *C. Rd.* 136 (1903): 705–707. **Ballore.**

Sur les anomalies de la pesanteur dans certaines régions instables. Note de F. de Montessus de Ballore.

Hydrology. *C. Rd.* 136 (1903): 572–574. **Martel.**

Sur l'enfouissement des eaux souterraines et la disparition des sources. Note de E.-A. Martel.

Hydrology. *C. Rd.* 136 (1903): 910-912. **Fournier and Magnin.**
Sur la vitesse d'écoulement des eaux souterraines. Note de E. Fournier et A. Magnin.

Hydrology. *B.S. Belge Géologie* 16 (1902): 166-169. **Jérôme.**
Exemple de la solution de menus problèmes d'Hydrologie, par le procédé de la coloration des eaux à l'aide de la fluorescéine. Par A. Jérôme.

Hydrology. *B.S. Belge Géologie* 16 (1902): 648-650. **Moulan.**
Note sur les venues d'eau dans les calcaires. Par T. Moulan.

Oceanography. *P.R.S. Edinburgh* 23 (1899-1901): 35-43. **Manley.**
The Examination of Sea-Water by an Optical Method. By J. J. Manley.

Oceanography. **Thoulet.**
Résultats des Campagnes Scientifiques accomplies sur son yacht par Albert I^{er} Prince Souverain de Monaco, publiés . . . avec le concours de Jules Richard. Fascicule xxii. Echantillons d'eaux et de fonds provenant des campagnes de la *Princesse-Alice* (1901). Par J. Thoulet. Imprimerie de Monaco, 1902. Size 14 × 11½, pp. 76. *Plates.*

Oceanography. *Z. Ges. Erdk. Berlin* (1903): 220. **Woeikof.**
Das Warmwasser vor den Strassen von Gibraltar und Bab-el-Mandeb. Von Prof. Dr. A. Woeikof.

Oceanography—Atlantic. *Ann. Hydrographiques* (1902): 160-166. ———
Résultats d'expériences sur les courants au large d'Ouessant et du Cap Finisterre et à l'entrée du détroit de Gibraltar.

Oceanography—Atlantic. *Ann. G.* 12 (1903): 13-18. **d'Almeida.**
Deux nouvelles cartes mensuelles de l'Atlantique du Nord. Par P. Camena d'Almeida. *Also separate copy.*

Oceanography—Currents. **Sandström and Helland-Hansen.**
Ueber die Berechnung von Meereströmungen. Von J. W. Sandström und B. Helland-Hansen. (Report on Norwegian Fishery- and Marine-Investigations, vol. ii., 1902, No. 4.) Bergen, 1903. Size 10 × 7, pp. 43. *Diagram.*

ANTHROPOGEOGRAPHY AND HISTORICAL GEOGRAPHY.

Cannibalism. *Ges. Völker- u. Erdk. Stettin, Bericht* (1901-1902): 19-22. **Sokolowsky.**
Kannibalismus. Von Dr. A. Sokolowsky.

Climate and Railways. *J.G.* 2 (1903): 178-190. **Brown.**
Climatic Factors in Railroad Construction and Operation. By R. M. Brown.

Commercial - Ginseng. *J.G.* 2 (1903): 26-31. **Carney.**
The Domestication of Ginseng. By F. Carney. *With Illustrations.*

Commercial—Ivory. *Mouvement G.* 20 (1903): 183-185, 191-194, 204-206. **Van Baer.**
L'Ivoire. Par R. Van Baer.

Historical—Apianus. **Ortroy.**
Bibliographie de l'œuvre de Pierre Apian. Par F. Van Ortroy. (Extrait du *Bibliographe moderne*, mars-octobre 1901.) Besançon, 1902. Size 10 × 6½, pp. 120. *Presented by the Author.*

Historical—Cartography. *Riv. G. Italiana* 9 (1902): 643-644. **Errera.**
Un particolare notevole in una Carta nautica del secolo xv. C. Errera.

On a legend showing the influence of Battista Beccario on the maps of Roselli.

Historical—Molanus. **Ortroy.**
Lettres de Jean Molanus (Van der Molen) à Gérard et à Bathélemy Mercator. Par F. Van Ortroy. Bruxelles: Kiessling et Cie., 1901. Size 9 × 6, pp. 72. *Presented by the Author.*

Historical—Toscanelli and Columbus. **Vignaud.**
Toscanelli and Columbus. Letters to Sir Clements R. Markham, C.B., etc., and to C. Raymond Beazley. With an Introductory Note and the Bibliography of this Controversy. London: Sands & Co., 1903. Size 9 × 5½, pp. 32. *Presented by the Author.*

GENERAL.

British Colonies. *Nineteenth Century* **53** (1903): 670–677. **Dyer.**
Corn-growing in British Countries. By E. J. Dyer.

British Empire—Census. *J.R. Statistical S.* **66** (1903): 31–70. **Baines.**
A Census of the Empire. By J. A. Baines.

Comparative Geography. *Rev. G.* **52** (1903): 345–353. **Deschamps.**
Archipels d'Amérique et d'Asie, Essai de Géographie comparative. Par Dr. L. Deschamps. *With Map.*

Education. *J.G.* **2** (1903): 83–95. ——
The Course of Study in Geography and Nature Study at the Speyer School, Teacher's College, Columbia University.

Educational—Exhibition. ——
Katalog der Ausstellung neuerer Lehr- u. Anschauungsmittel für den Unterricht an Mittelschulen, K. K. Österreichisches Museum für Kunst u. Industrie in Wien. Wien: C. Fromme, 1903. Size 9 × 6, pp. xii. and 160. *Presented by Dr. K. Peucker.*

Medical Geography. **Clemow.**
The Geography of Disease. By Frank G. Clemow. Cambridge: The University Press, 1903. Size 8 × 5½, pp. xiv. and 624. *Maps. Price* 15*s. Presented by the Syndics of the Cambridge University Press.*

Medical Geography. **Manson.**
Tropical Diseases. A Manual of the Diseases of Warm Climates. By Patrick Manson. New and Revised Edition. London, etc.: Cassell & Co., 1903. Size 7½ × 4½, pp. xvii. and 756. *Plates and Illustrations. Price* 10*s.* 6*d. net. Presented by the Publishers.*

Medical Geography—Malaria. *Popular Sci. Monthly* **62** (1903): 521–525. **Herrick.**
The Relation of Malaria to Agriculture and other Industries of the South. By Prof. G. W. Herrick.

Medical Geography—Malaria. *Climate* **4** (1903): 221–235. **Sambon.**
Malaria. By Dr. L. W. Sambon. *With Illustrations.*

Medical Geography—Tsetse-fly Disease. **Broden.**
B.S. d'Études Colon. 10 (1903): 225–227.
Le surra ou "maladie de la tsetsé" chez les bœufs, à Léopoldville. *With Illustrations.*

Spanish Grammar. **Weintz.**
The Spanish Principia.—Part i. A First Spanish Course. Containing Grammar, Delectus, and Exercise Book, with Vocabularies. By H. J. Weintz. London: J. Murray, 1903. Size 7½ × 4½, pp. x. and 180. *Price* 3*s.* 6*d. Presented by the Publisher.*

Travel. **Cockerell.**
Travels in Southern Europe and the Levant, 1810–1817. The Journal of C. R. Cockerell, R.A. Edited by his Son, Samuel Pepys Cockerell. London, etc.: Longmans, Green & Co., 1903. Size 9½ × 6, pp. xii. and 286. *Portrait. Price* 10*s.* 6*d. net. Presented by the Publishers.*

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England and Wales. **Bartholomew.**

The Survey Atlas of England and Wales. A series of eighty-four plates of maps and plans, with Descriptive Text, illustrating the Topography, Physiography, Geology, Climate, and the Political and Commercial Features of the Country. Designed by and prepared under the direction of J. G. Bartholomew, F.R.S.E., F.R.G.S. Parts 5 and 6. Edinburgh: John Bartholomew & Co., 1903. *Presented by the Publishers. Price* 2*s.* 6*d. each part.*

Part v. contains the following sections of the ½-inch map: No. 40, Brecon and Builth; 41, Cardigan; 42, Milford Haven; 43, Swansea and Carmarthen. In addition to these, this part also includes the dedication and contents of text. Part vi. contains: section 21, Cromer and the Broads; 22, The Wash; 44, Cardiff and Merthyr; 45, Bristol and Monmouth. As part vi. is issued with part v. in June, there will be no part published in July.

Liverpool Bay. **Belam and Ashton.**

Chart of Liverpool Bay. Surveyed by the Marine Surveyor of the Mersey Docks and Harbour Board, 1902. Scale 1000 yards to an inch. Henry Belam, Commander, R.N., Marine Surveyor; H. G. G. Ashton, F.R.G.S., Assistant Marine Surveyor. *Presented by H. G. G. Ashton, Esq.*

New edition, showing alterations in sandbanks and soundings.

ASIA.

Asia Minor. **Kiepert.**

Karte von Kleinasien. Scale 1 : 400,000 or 6·3 stat. miles to an inch. Von Dr. Richard Kiepert. Sheets: CV., Malatia, and DV., Haleb. Berlin: Dietrich Reimer (Ernst Vohsen), 1902. *Price* 6 *marks.*

British North Borneo. **British North Borneo Company.**

A Map of British North Borneo. Compiled from the English Admiralty Charts, and from the Surveys and Explorations of Messrs. F. Witti, W. B. Pryer, F. Hatton, Henry Walker, D. D. Daly, and R. D. Beeston, in the service of the British North Borneo Company. Scale 1 : 633,600 or 10 stat. miles to an inch. 2 sheets. London: Edward Stanford, 1903. *Price* 2*s.* 6*d.*

A good general map of British North Borneo, showing the present state of our knowledge of the country. Soundings are given round the coast, and the map is divided into two minute squares. Land sold to subsidiary companies and others is indicated. In addition to British North Borneo, the map also includes the adjacent portions of Brunei and Sarawak.

Indian Government Surveys. **Surveyor-General of India.**

Indian Atlas, 4 miles to an inch. Sheets: 21 N.E., parts of Udaipur, Jodhpur, and Sirohi (Rajputana Agency), and of Idar, Danta, and Palanpur, Native States (Bombay Presidency), additions to 1897. 35 N.E., parts of Native States of Gwalior and Indore (C.I. Agency), and of Udaipur, Tonk, Bundi, and Jhalawar (Rajputana Agency), additions to 1901. 35 S.E., parts of Native States of Udaipur, Jhalawar, Partabgarh, and Banswara (Rajputana), and of Gwalior, Indore, and Western Malwa Agencies (Central India), corrections to 1899, 1900. 38 S.E., parts of districts Aurangabad and Bid (Nizam's Dominions), Ahmednagar and Nasik (Bombay Presidency), additions to 1900, 1901. 71 N.E., parts of districts Jubbulpore, Damoh, Mandla, and Narsinghpur (Central Provinces), and of Rewah (C.I. Agency), additions to 1901, 1902. 105 N.E., parts of districts Palamau, Ranchi, and Singhbhum, and of Jashpur State (Chota Nagpur), Bengal, additions to 1896. 125 S.E., parts of districts Sylhet, Cachar, and North Lushai Hills (Assam), and Native State of Hill Tippera (Bengal), additions to 1899. 130 S.E., parts of districts Naga hills, Manipur Native State, and of Naga tribes (Assam), additions to 1894.—India, 64 miles to an inch, 4 sheets.—Railway System of India, 80 miles to an inch, corrected up to April 30, 1902.—Province of Assam, 16 miles to an inch, 2 sheets, 1902.—Assam Survey, 1 mile to an inch. Sheets: (Preliminary Edition) 61, districts Darrang and Nowgong, Seasons 1887–88, 1891–92, and 1897–98, 1902; 165, district Lushai Hills, Season 1899–1901, 1902.—Bengal Survey, 1 mile to an inch. Sheets: 127, parts of districts Ranchi and Singhbhum and Ganpur State, Season 1862–63, 1902; 128, parts of district Singhbhum and States of Gangpur and Bonai, Season 1860–62, 1902; (Preliminary Edition) 141, 144, 145, district Mazaffarpur, Season 1895–96, 1901.—Lower Provinces, Bengal, district Ranchi, 4 miles to an inch, additions and corrections up to October, 1901, 1902.—Bombay Survey, 1 mile to an inch. Sheets: 183, parts of Panchi Mahalo District and States of Baroda, Chhota Udeypur, and Bariya, Seasons 1883–84 and 1890–91, corrected up to February, 1898, 1901; 206, parts of Ratnagiri District, and Kolhapur and Southern Maratha Agency, Season 1892–93, additions and corrections up to March, 1902.—Burma Survey, 1 mile to an inch. Sheets: 247 (New Series), parts of districts Meiktila, Yamethin, and Southern Shan States, Seasons 1890–91 and 1898–1901, 1902; 288 (307 Old Series), parts of districts Mandalay, Kyaukse, Northern and Southern Shan States, Seasons 1895–97, 1902; (Preliminary Edition) 289 (New Series), Northern and Southern Shan States, and districts Mandalay and Kyaukse, Season 1899–1900, 1901; 431 (New Series), part of Northern Shan States, Season 1900–01, 1902; (Preliminary Edition) 434 (New Series), part of South Hsenwi State, Season 1899–1900, 1901; 439 and 508 (New Series), parts of Southern Shan States, Seasons 1897–98 and 1900–01, 1902; 507 (New Series), parts of Northern and Southern Shan States, Season 1900–01, 1902.—Upper Burma, 16 miles to an inch; (Third Edition) 2 sheets, 1902.—North-Eastern Frontier, 4 miles to an inch. Sheets: (Fourth Edition) 23 S.E., Burma and China (Yun-nan Province), Seasons 1894–95 and 1897–1900, 1902; 28 S.E., S.W., 29 N.E., N.W., S.E., 30 S.E., 37 N.E., 44 N.W., S.W.; China, Ssu-chuan Provinces, Season 1899–1900, 1902; 29 S.W., 30 S.W., 39 S.W., China, Yun-nan and Ssu-chuan Provinces, Season 1899–1900, 1902; China, Yun-nan Province, Season 1898–1900, 1902; 38 N.W., China, Ssu-chuan and Kuei-Chou Provinces, Season 1898–99, 1902; 38 S.W., China, Yun-nan and Kuei-Chou Provinces, Season 1898–99, 1902; 44 N.E., China, Hu-Pei Province, Season 1898–99, 1902; 44 S.E., China, Hu-Pei and Hu-nan Provinces, Season 1898–99, 1902.—South Eastern Frontier, 4 miles to an inch. Sheets: 12 N.E. and N.W., China, Yunnan Province, Season 1898–1900, 1902.—Central Provinces, District Betul, 8 miles to an inch, 1902.—Hyderabad Assigned Districts, District Amraoti, 8 miles to an inch, 1902.—United Provinces of Agra and Oudh, district Pilibhit, 8 miles to an inch, corrected up to 1901, 1902.—Chart of Triangulation and Traverse, No. 20 Party (Burma Forest), 2 miles to an inch. Sheets: 254 and 256 (Burma), New Series, Seasons 1890–95, 1902.—China Field Force Survey, 2 miles to an inch. Sheets: 1–9, 12, 13, 15–21, China (Chih-Li Province), Season 1900–01, 1902.—Central India and Rajputana Survey, 1 mile to inch. Sheet 228 (Second Edition), parts of States Jaipur, Jodhpur and Kishangarh (Rajputana Agency), Seasons 1865–66 and 1867, additions and corrections to July, 1882, 1902. *Presented by H.M. Secretary of State for India, through the India Office.*

Peking and Tientsin. **Königl. Preuss. Landes-Aufnahme.**

Plans of Peking, scale 1: 17,500 or 3·5 inches to 1 stat. mile; Gesandtschaftsviertel in Peking, scale 1: 3000 or 21·12 inches to 1 stat. mile; Tientsin, scale 1: 25,000 or 2·5 inches to 1 stat. mile. Aufgenommen 1900–1901 von den Feldtopographen des Deutschen Ostasiatischen Expeditions-Korps. Herausgegeben von der Kartographischen Abtheilung der Königl. Preuss. Landes-Aufnahme 1903.

AFRICA.

Central Africa. **Universities' Mission to Central Africa.**

The Universities' Mission to Central Africa Atlas, with descriptive letterpress by members of the staff of the Mission and others, and a preface by Sir H. H. Johnston. London: Offices of the Universities' Mission to Central Africa, 1903. *Price 2s. 6d. net. Presented by the Secretary of the Universities' Mission to Central Africa.*

An atlas of eight sheets of maps and plans, with descriptive letterpress, showing the stations and spheres of operations of the universities' mission in Central Africa. The maps and plans, which have been prepared by Messrs. Bartholomew, are clear and good, and the fact that the text is by members of the mission staff personally acquainted with the special districts they describe adds considerably to its interest.

Congo State and North-West Rhodesia. **Grey.**

Tanganyika Concessions, Ltd. Mr. George Grey's Maps showing Exploration and Discoveries to September 30, 1902. Scales 1: 506,880 or 8 stat. miles to an inch and 1: 1,000,000 or 15·7 stat. miles to an inch. London: Edward Stanford, 1903.

These maps include the regions of North-West Rhodesia and the Congo Free State to the west of Lakes Bangweulu and Mweru and north of lat. 13° S. They are based upon recent route surveys and explorations, and although no pretence has been made at great accuracy, they fill in a considerable area that has hitherto been very imperfectly known. The maps must only be considered as provisional, and members of Mr. Grey's expedition are now making a more complete survey of the region.

German East Africa. **Sprigade and Moisel.**

Karte von Deutsch-Ostafrika. Scale 1: 300,000 or 4·7 stat. miles to an inch. Begonnen unter Leitung von Dr. Richard Kiepert; fortgesetzt unter Leitung von Paul Sprigade und Max Moisel. Sheet E 5, Kissaki. Berlin: D. Reimer (E. Vohsen), 1902.

Transvaal. **de Hora.**

Mining and Geological Map of the Witwatersrand Goldfields. Compiled from authentic information and actual survey. By M. H. de Hora, C.E., M.E. July, 1902. 9 sheets. London: G. Philip & Son. *Price, unmounted in sheets, with index, 21s.*

A considerable amount of detailed information is given on this map concerning mining properties, water-supply, direction of reefs, and other similar matters connected with the Witwatersrand Goldfields. It is accompanied by an index to names.

Tunis. **Service Géographique de l'Armée, Paris.**

Tunisie. Scale 1:50,000 or 0·78 stat. mile to an inch. Sheet No. lxiii., Kairouan. Paris: Service Géographique de l'Armée. *Price 1.50 fr.*

AMERICA.

California. **Kelsey and Manson.**

Map of the State of California showing the Three Principal Factors in the Water-Supply. Scale 1 : 760,320 or 12 stat. miles to an inch. Compiled for the California Water and Forest Association by Fletcher F. S. Kelsey, directed by Marsden Manson, C.E. September, 1900. *Presented by Marsden Manson, Esq.*, C.E.

This map shows the areas of the principal watersheds by red lines, with figures giving the square miles in each, the mean annual rainfall in inches, and the timber and brush-covered areas and forest reserve boundaries. Altogether the map is interesting and instructive in connection with the physical geography and water-supply of California. The data upon which it is based has been obtained from the most reliable sources, that for the drainage areas having been furnished by the State Engineering Department, the rainfall from the U.S. Weather Bureau, records of J. B. Lippincott, C.E. (Resident Hydrographer, U.S. Geological Survey), and the State Engineering Department; while the reports and maps of the California State Board of Forestry, 1886 and 1888, and the U.S. Geological Survey of 1898, have furnished the data for the forest and brush areas.

Canada. **Surveyor-General of Canada.**

Sectional Map of Canada. Scale 1 : 190,080 or 3 stat. miles to an inch. Emerson Sheet (1), East of Principal Meridian. Revised to February 25, 1903. Lake of the Woods Sheet (1A), East of Principal Meridian. Revised to April 14, 1903. Cross Lake Sheet (2A), East of Principal Meridian. Revised to April 1, 1903. Dufferin Sheet (9), West of Principal Meridian. Revised to September 3, 1902. Armit Sheet (30), West of Principal Meridian. Revised to April 11, 1903. Red Deer Forks Sheet (59), West of Third Meridian. Revised to March 31, 1903. Ottawa: Surveyor-General's Office, 1903. *Presented by the Surveyor-General of Canada.*

Manitoba. **Department of the Interior, Canada.**

Manitoba. Scale 1 : 792,000 or 12·5 stat. miles to an inch. Ottawa: Department of the Interior. *Presented by the Department of the Interior, Canada.*

GENERAL.

Eastern Empires. **Grundy.**

Murray's Handy Classical Maps. The Eastern Empires. Edited by G. B. Grundy, M.A., of Brasenose College, Oxford. London: John Murray. *Price* 1*s*. *Presented by the Publisher.*

This sheet contains two maps, the first of which, on the scale of 1 : 12,000,000, is orographically coloured, and shows the empire of Alexander the Great; whilst the second, which includes a slightly larger area (on the scale of 1 : 14,400,000), represents, by different tints, the empires of the Baylonians, Lydians, Medes, and Persians. Like others of this useful series, the maps are accompanied by an index of place-names.

World. **Lehmann and Scobel.**

Atlas für höhere Lehranstalten mit besonderer Berücksichtigung der Handelsgeographie. Bearbeitet und herausgegeben von Dr. R. Lehmann und A. Scobel. Bielefeld und Leipzig: Velhagen & Klasing, 1903.

Although it is not so stated, this atlas may be considered as a new edition of that brought out in 1897 under the superintendence of Dr. R. Lehmann and Dr. W. Petzold. It contains eighty sheets of maps, plans, and diagrams, clearly drawn and printed in colours, dealing with physical geography, meteorology, vegetation, population, and fauna, in addition to those showing political divisions.

World. **Stieler.**

Neue, neunte Lieferungs-Ausgabe von Stielers Hand-Atlas, 100 Karten in Kupferstich. 17 & 18 Lieferung. Gotha: Justus Perthes. *Price* 60 *pf. each part.*

Contains the four following maps: Nos. 17 and 18, Österreich-Ungarn, Bl. 1 u. 2, 1 : 1,500,000, von C. Vogel. No. 38, Grossbritannien, Südl. Blatt., 1 : 1,500,000, von O. Koffmahn. No. 58, Ost-Sibirien, 1 : 7,500,000, von H. Habenicht. The two last are new maps, while the others are revised editions.

CHARTS.

Admiralty Charts. **Hydrographic Department, Admiralty.**

Charts and Plans published by the Hydrographic Department, Admiralty, during March and April, 1903. *Presented by the Hydrographic Department, Admiralty.*

No.	Inches.	
3353 to 3364		Tidal streams, Channel islands. Each 4*d*. The same twelve charts bound together in an Atlas. 5*s*.
3315 m	= 1·30	England, south coast:—Straight point to Portland. 3*s*. 6*d*.
3302 m	= 6·9	Scotland, west coast:—Narrows of Raasay and Caol More. 2*s*. 6*d*.
3331 m	= 6·88 3·4	Scotland. Hebrides, west coast:—Flannan isles or Seven Hunters, Sulisker, North Rona. 1*s*. 6*d*.
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1465 m	= 0·26	South America, east coast:—Sao Sebastião island to Bom Abrigo island. 2*s*. 6*d*.
3336 m	= 0·24	Aleutian islands:—Unimak and Akutan passes and approaches. 2*s*. 6*d*.
395 m	= 1·3 4·2	Africa, west coast:—Isles de Los, Konakri road.
3347 m	= 5·28	Japan:—Plans on the north coast of Nipon. 1*s*. 6*d*.
2035 m	= 1·99	New Zealand, north island:—Coromandel harbour. 1*s*. 6*d*.
3338 m	= 1·6	Pacific ocean. Gilbert island:—South part of Nonuti. 1*s*. 6*d*.
2221		Black sea. Plans of Russian ports on the north shore. Plan added:—Gagri anchorage.
2220		Black sea. Ports and anchorages on the south shore. Plan added:—Kerasunda.
1535		Plans on the east coast of Iceland. Plan added:—Horne fiord entrance.
1806		Africa, west coast. Great Fish bay to Walfisch bay. Plan added:—Swakopmund road.
2662		Celebes. Ports in Makassa strait. New Plans:—Majene road and Balangnipa road.
3209		Celebes. Bays and anchorages in Makassar strait. Plan added:—Mampya road.
769		Admiralty and Hermit islands. Plan added:—Carola bay. New plan:—Hermit islands.

(*J. D. Potter, Agent.*)

Charts Cancelled.

No.		Cancelled by	No.
2035	Coromandel harbour.	New chart. Coromandel harbour	2035
3269	Nonuti, south-west anchorage; plan on this sheet.	New plan. South part of Nonuti	3338

Charts that have received Important Corrections.

No. 1610, England:—North Foreland to Orfordness. 2966, Lapland:—Port Ekaterininskoi and Pala bay. 2280, White sea:—Arkhangel bay. 2366, Germany:—north coast:—Sheet II.:—Arkona to Dievenow river. 2369, Germany, north coast:—Rixhöft to Bruster-ort. 88, Spain, north coast:—Plans:—San Sebastian, entrance of San Martin de la Arena. 1130, Sardinia:—Cagliari bay. 1550, Iceland:—Reydar and Faskrud fiords. 414, West Indies:—Cuba, Havana harbour. 2677, West Indies, Leeward islands:—Culebra or Passage islands. 804, West Indies, Leeward islands:—Approaches to Pointe à Pitre, etc. 3107, South America, east coast:—Cape St. Thomé to Guaratiba point. 2837B, Persian gulf, northern portion. 2760, Sumatra, Sheet I.:—Acheh head to Tyingkok bay. 2201, Sumatra:—Plans in. 709, Sumatra, west coast:—Ujong Masang to Ujong Indrapura. 941B, Eastern archipelago, western portion, sheet 2. 942A, Eastern archipelago, eastern portion, sheet 1. 934, Eastern archipelago:—Surabaya, Bali, and Sapudi straits. 2636, Philippine islands:—Strait of Makassar, north part. 389, China, north-east coast:—Shanghai harbour. 1236, China, north coast:—Port Arthur. 2657, Japan:—Gulf of Tokyo. 2388, Russian Tartary:—Sea of Okhotsk. 1750, Australia, south coast:—Port Adelaide. 2130, Tasmania: —Port Davey. 3269, Pacific ocean, Gilbert islands:—Tarawa lagoon. 968, Pacific ocean, Ellice islands:—Mua and Mata Utiu anchorage.

(*J. D. Potter, Agent.*)

North Atlantic Ocean and Mediterranean Sea. **Meteorological Office.**

Pilot Chart of the North Atlantic and Mediterranean for June, 1903. London: Meteorological Office. *Price* 6*d*. *Presented by the Meteorological Office, London.*

United States Chart. **United States Hydrographic Offi**

Pilot Chart of the North Pacific Ocean for June, 1903. U.S. Hydrographic Office, Washington, D.C. *Presented by the U.S. Hydrographic Office.*

PHOTOGRAPHS.

California. **Archibal**

Twelve photographs of the Yosemite valley, California, taken by Captain J. F. J. Archibald. *Presented by Captain J. F. J. Archibald.*

An excellent little series of platinotypes, measuring 6¾ × 4¾ inches.

(1) The "floor" of the Yosemite valley; (2) Upper Yosemite valley; (3) Yosemi valley in winter from Inspection point; (4) Upper entrance to Yosemite valley; (El Capitan, Yosemite valley; (6) The pack-train going into Yosemite valley; (7 an 9) The upper and lower Yosemite falls; (9) Merced river, Yosemite valley; (1 The Half-dome, Yosemite valley; (11) Gigantic sequaia tree, Mariposa county.

Gold Coast. **Worsno**

Seventy-five photographs of the Gold Coast, taken by T. H. Worsnop, Esq. *Presented by T. H. Worsnop, Esq.*

This is a set of Kodak photographs representing typical coast scenery of the Gol Coast. Although small, most of them are fairly clear.

(1) Convoy of salt, below Amedica, Volta river; (2) Diving for shells near the villag of Dodi, Volta river; (3) Village on sand spit near Dodi Custom station, Volta rive (4) Kratchie falls; (5) Head of Kratchie falls; (6) Foot of Kratchie falls; (7) Hau Man, Kratchie; (8) Carriers waiting for loads, Kratchie; (9) Women carriers wai ing for loads, Kratchie; (10) Carriers starting on march from Kratchie; (11 and 1 Between Akusi and Kpong; (13) Some of the larger rocks at the head of Aku rapids; (14) Looking up the Volta river from Akusi landing; (15) Volta river abo Akusi rapids, looking north towards Kpong rapids; (16) One of the rocks in the Aku rapids; (17 and 18) Entering the Akusi rapids from Akusi; (19) Rocks and sand sp opposite Akusi Custom station; (20) Akusi landing, steamer left high up on the ban in 1884; (21) Akusi rapids; (22) Rapids between Akusi and Kpong; (23) Rocks i Kpong rapids; (24) River in front of Kpong Custom station; (25) Kpong marke place; (26) Head of Kpong rapids; (27) Prisoners at Kethu; (28) Meui or Apati rapids; (29) Looking south over Apfacon rapids; (30–33) Looking up west channe Senki rapids; (34) Senki rapids; (35) Custom station, Assacherie; (36) Lookin north over Yabin rapids; (37) Rocky point about 2 miles south of Fasu Custo station; (38–40) Simpi rapids; (41) Outcrop of quartz just above Akwamu, on th west bank of the Volta river; (42) O'Busumanu station, looking north; (43) Jafa rapids; (44) Apatifo or Apasse rapids; (45) Barrier rocks, Volta river; (46) Lookin south over Barrier rocks; (47) Yabin rapids, looking south, showing the ridge of rock that run across the head of the rapids from the island in the middle of the stream the west bank of the river; (48) Barrier rocks above Yambawso station; (49 and 5 Akrosu or Gingar rapids; (51) Chesiease Custom station; (52) Chome rapids; (Small river entering the Volta river just above Assacheri station; (54) Kete market (55) Kamfiofi or Split Barrier rocks; (56) Agrama rapids; (57) Looking south ov the Agrama rapids; (58) Mr. Worsnop's canoe.

New South Wales. **N.S.W. Railway Commissioner**

Photographic reproductions of Places Convenient to the Lines of the New South Wales Government Railways. Published by authority of the Railway Commissioners. *Presented by the Agent-General for New South Wales.*

An album of photographic reproductions of places of interest in the neighbourhoo of New South Wales railways, prepared for the use of tourists. They are as follows:—

(1) Mosman bay, Sydney harbour; (2) Botanical gardens; (3) Bulli pass; (4 Stanwell park; (5) Tree ferns, Cambewarra mountains; (6) Hawkesbury railway bridge; (7) Hawkesbury river; (8) Woy Woy; (9) Meryla Twin falls, Moss vale; (10 Mount Kosciusko; (11) View on the Nepean river; (12) The Weeping rock, Went worth falls; (13) Bridal veil, Katoomba falls; (14) Katoomba falls; (15) Fairy Del waterfall; (16) The Willows, Jenolan caves.

N.B.—It would greatly add to the value of the collection of Photo graphs which has been established in the Map Room, if all the Fellow of the Society who have taken photographs during their travels, would forward copies of them to the Map Curator, by whom they will b acknowledged. Should the donor have purchased the photographs, i will be useful for reference if the name of the photographer and hi address are given.

NATIONAL ANTARCTIC EXPEDITION.

PROVISIONAL MAP.

Koettlitz & Ferrar Jan. 14-26.
Shackleton, Wilson, Ferrar Feb. 18-22
Koettlitz & Bernacchi Sep. 24 - Oct. 2.
Barne. Nov. 1-23.
Armitage & Ferrar Sep. 10 - 24
Scott, Shackleton, Skelton, Wilson. Ferrar, Sep. 2-5.
Koettlitz & Skelton Nov. 3-7.
Royds & Koettlitz Sep. 10-19.

The

Geographical Journal.

No. 2. AUGUST, 1903. Vol. XXII.

EARTH-MOVEMENTS IN THE BAY OF NAPLES.*

By R. T. GÜNTHER, M.A., F.R.G.S., Fellow of Magdalen College, Oxford.

> "Jacent in litore ædificiorum fragmenta quæ romanam maiestatem præseferunt, abierunt in scopulos crustatis piscium generibus habitatos."—Capaccio, 'Hist. Neap.,' cap. xiv. 1607.

In a preliminary note read at the Bradford Meeting of the British Association in 1900, it was suggested that the ancient ruins in the sea along the Neapolitan shore might yield satisfactory information regarding the Roman coast-line of the Phlegræan Fields. With this view a new survey of parts of the coast was prepared and an interim report was laid before the 1901 Meeting by the Committee on "the changes of the land-level of the Phlegræan Fields." We hope that, by describing the more noteworthy geographical results, a light may be thrown on some vexed problems and may tend to elucidate them. Babbage and others have shown that the burrows of marine shell-fish in the columns of the Temple of Serapis, at a height of about 19 feet above sea-level, bear witness to a subsidence followed by an elevation of the land through not less than this distance since the construction of the building. We have been able to collect supplementary evidence which indicates that since the Roman dominion the Neapolitan coast first sank about 35 feet, and then rose about 19 feet to slightly above its present level. Reasons will be given for believing that this great oscillatory movement was not of a seismic nature and confined to the immediate vicinity of a volcano, but affected so large an area that it must be regarded as of the order of those slow and majestic movements of the crust of the Earth which are now in progress in Sweden and elsewhere, by which continents have risen from the sea, and which can often only be detected by observations spread over a long space of time.

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* Read at the Royal Geographical Society, February 9, 1903. Map, p. 236.

The assertion that the land-level in Roman times was about 16 feet higher than it is at present, depends partly upon the discovery of two submerged regions covered by the foundations of numerous houses, perhaps the forgotten site of Parthenope or Palæpolis, with an ancient harbour and a coast road, which are not without archæological interest.

To the authors whose works inspired and facilitated our labours, we would make most grateful acknowledgment. Without Lyell, Niccolini, Beloch and many another, we could have accomplished but little in the time at our disposal. We also thank our fellow-members of the British Association for their encouragement of the work, and H.B.M. Consul-General at Naples, Mr. E. Neville-Rolfe, for furthering our plans.

I. CAPRI.

Indications of changes in the level of the island of Capri are very numerous and clear, and many are of comparatively recent date.

It is not proposed to discuss here that vast series of earth-movements which have resulted in the uprising of the Capriote Tertiary limestones from a horizontal position on the sea-bottom to the surface and higher, with a dip from south to north at angles varying from 25° to 70°. Concerning the details of these very ancient changes on a gigantic scale we have but scanty knowledge; they no doubt were in operation before the strata of Capri had become dislocated from those of an extensive limestone continent. Some of the evidence we are about to consider points to the long-continued existence of the island nearly in its present form.

The most important evidence of relative levels of sea and land in former times is of three kinds. Firstly, *marks of marine erosion*, occurring either above or below the present sea-level; secondly, *raised beaches*, or beaches apparently collected by, but now beyond the reach of the waves; and, thirdly, *submerged constructions*, now standing at a lower level than that at which they were built.

Marine Erosion at the Present Day.—The details of the process of erosion of limestone by the sea may be well studied at many places around the coast of Capri. Owing to the absence of a large tide in this part of the Mediterranean, the erosive action of the waves is nearly confined to one horizontal zone. In those parts of the island where the cliffs rise sheer from deep water, and are neither too much exposed to the fierce onslaught of storm waves, nor composed of rock of too friable a nature, there we find a groove chased horizontally along the face of the cliffs at the water-line. The size and depth of this groove varies with the hardness or exposure of the rock, but on the whole it is deepest at the mean tide-level.

The most vigorous erosion, therefore, is taking place between wind and water.

Immediately above and below the water-line, erosion is proceeding very slowly; above, partly on account of the absence of the eroding medium, partly on account of a protective coat of calcium carbonate dissolved from the rocks above and spread by a trickling film of spring water. In some places there is an organic growth forming a conspicuous black band distant a foot or two from the water; this also seems to have a protective action. Beneath the surface of the water, but near enough to benefit by the foam of breaking waves, a garb of coralline and algal growth luxuriates, and protects the stone.

The size and appearance of the narrow horizontal groove indicate that it is chiefly the result of steady erosion by solution in *calm* weather at the surface of the water. The cliffs of Capri tell us in clear geological sign-language that the waves which dash up in storms can have taken but a small part in the etching of the groove. On the north side of the island calm has prevailed, and the grooving and undercutting are well marked; on the south, full exposure to the open sea has resulted in faster scaling from the face of the cliffs and in the obliteration of the groove of solution.

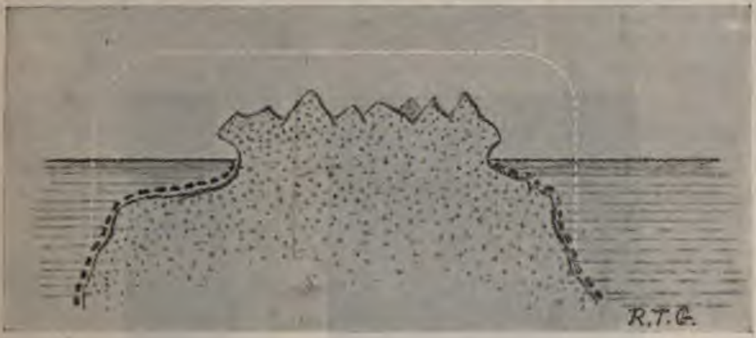

FIG. 1.—PARTIALLY ERODED BLOCK OF LIMESTONE.

……… *Original contour.* - - - - *Seaweed.*

When rain and spray fall on flat limestone surfaces near the sea-level, solution is very rapid. The result may be seen in all stages, on many a partially submerged rock and boulder on the north and east coasts. The process is indicated in the diagram, which was drawn from an actual block of limestone (Fig. 1). The dotted line represents the original contour of the block. The portion below water has nearly retained its original dimensions, having been protected by a thick growth of algæ. At the water-line there is a groove of solution all round the stone; and the upper surface, which is undergoing rapid disintegration by rain and spray, is jagged and uncomfortable to walk upon. Soon all will be planed down to low-water mark, and then the kindly covering of weeds will hinder further destruction.

The furrow at the present water-level runs in and out of the older caves and cavities like a hollow moulding round the recesses of a building, and may be traced almost all round the island in the less exposed parts. This furrow is rarely more than a foot in depth; but where natural cracks or soft places in the rocks have favoured, the erosive action has been more extensive, and deeper hollows and little caves have been scooped out.

The Upper Erosion-line.—Similar marks of erosion occur at other levels above the surface of the sea. In some places they are as clear as if they had been cut yesterday, in others they have become almost covered up by newly deposited stalactitic matter; in the more weathered parts they have been entirely obliterated. Wherever they occur, they afford an unmistakable indication of having been formed at and by the surface of the sea, and of having been subsequently raised beyond its reach.

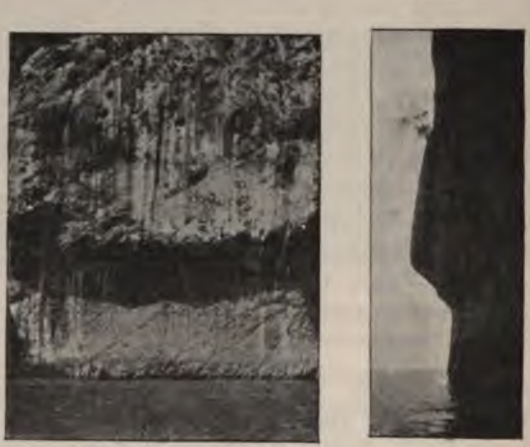
A, Elevation.
B, Profile.

FIG. 2.—UPPER EROSION LINE ON LIMESTONE OF CAPRI.

At a height varying from 23 feet to 12 feet above the present sea-level, the island is girt about with a line of holes, grooves, and undercuttings which are similar in character to those at the present water-level, save only that they are less continuous. For these marks of erosion no other explanation can be offered, but that they were wrought by causes identical with those which have produced the groove at the present sea-level.

To explain the phenomena, two theories are possible. We may either believe, with Niccolini, that the sea-level in the course of ages has been subject to alteration, or that the land has moved. Of the two, we favour the latter; for whereas we are not aware of any proof of change of sea-level, Capri is a geological monument to change of land-level. The originally horizontal beds of Tertiary limestone have been tilted so as to dip with an inclination which increases greatly from east to west. From the Faraglioni to Pta. Ventroso the beds dip at angles increasing from 25° to 35°; near the Green Grotto the dip is nearly 40°; while at the south-west corner the dip is as much as 60° to 70°.

It is not surprising, therefore, to find that this tilting has continued in the most recent period, and that the marks of the upper erosion-line lie in a plane inclined at an angle to the horizontal. In other words, the past and present marks of marine erosion are 23 feet apart at the eastern end of Capri, but only 12 feet apart at the western end. We cannot suppose that the sea has changed its horizon. The land must, therefore, have moved as if on a distant hinge 4 miles away to the west, and have turned through an angle of nearly two minutes of arc.

As will appear in the sequel, there is good reason to place the erosion of the upper water-line at a period subsequent to the Roman dominion, and this gives us a basis for a calculation of the rate at which geological changes of magnitude may take place.

We find that the changes in the relative level of land and sea have not been of a uniform but rather of a spasmodic character. All indications point to the land having remained nearly stationary for considerable periods of time, and of having then, in a relatively brief space, shifted to a new level. As a proof, we find that the marks of erosion are confined to narrow zones. The island, moreover, appears to have remained stationary in its present position for a shorter period than at the 23 to 12 foot level, for the upper marks are deeper and more conspicuous than those along the present water-level. Hence, if we may assume that the rate of marine erosion has been fairly uniform, we can estimate the relative duration of periods during which the land-level has remained constant.

Starting from the south-western corner of the island near the Pta. Carena, we find the upper line of holes, grooves, and underouttings about 12 feet above the present water-level. It may be traced at various spots along the west coast, but, owing to the great extent to which the weathering of the limestone has proceeded, the marks are not as conspicuous as those along the northern and eastern cliffs.

In and near the Grotta Azzurra the same line of hollows rises about 16 to 17 feet above the water, and is continued within the grotto itself, thus proving that it was submerged, and inaccessible.

At the Pta. Sbrussa this upper erosion line is very noticeable, and, keeping approximately to the same level, small borings in the rocks can be traced nearly as far as the Pta. Trasele.

Further to the east, the massive walls of the so-called Bagni di Tiberio have been levelled nearly to the same height—a remarkable coincidence suggestive of a common cause.

Near the north-eastern cape, the isolated Scoglio Ricotta shows the grooving of the old water-line, but to the south-west of the Pta. Chiavica, in the vicinity of the Grotta Bianca, and at many places round the Cala di Matromania, the undercutting of the rock is seen in its greatest perfection and at its greatest height (23 feet) above the present water-level. Protected from erosion both by its height above the sea and by a foreshore of *débris* from the cliffs above, and in some spots painted over with a coat of preservative calcareous incrustation renewed continually, these low land[*] marks have perfectly resisted the destructive hand of time.

The marks of erosion may also be well seen upon the west side of the isolated Scoglio Matromania, which in this respect is a diminutive model of the entire island, for on the lee side the undercutting is well preserved, but has been weathered away from the side that is more exposed. The vertical cliffs of the Faraglioni and of the Monacone bear the water-marks of the same low land-level.

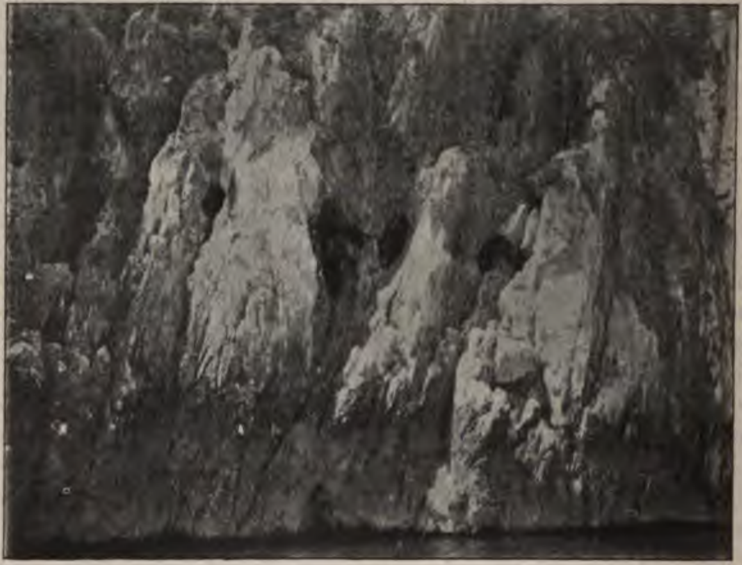

FIG. 3.—UPPER LINE OF HOLES, NEAR PUNTA SBRUSSA.
About 18 feet above the water-line.

At several places along the coast between the Pta. Ventroso and the Pta. Carena, conglomerated beaches may be seen resting upon shelves of rock raised above the sea-level. Some of these are mere accumulations of *débris* which have fallen from higher levels, but others owe their origin to the action of the waves when these beaches were on the sea-level.

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[*] Cp. "high water."

When a cavity in the face of the rock has once come into existence, the unaided action of the sea-water cannot increase its size to any considerable extent, for the upper surface of the excavation above water would soon be out of reach of that element, and the floor would be protected by seaweeds. If, however, the level of the land should be elevated or depressed very gradually, a cavity already in existence at the earlier water-level would be enlarged. An elevation of the land would cause the floor of the cavity to rise into the plane of maximum erosion. Similarly, if the land-level be depressed, the roof would be eroded.

It is to the simultaneous action of these two processes of gradual alteration of land-level and of erosion that the larger caves of Capri owe their origin. The caves are, for the most part, wide-mouthed, and of no great depth as compared with their height and breadth. They are of the type we may term sea-caves, as distinguished from stream-caves which have been produced by the flow of fresh water, like the lengthy subterranean passages with many lateral embranchments in Kentucky and Carniola, of which there are no examples of any size in Capri. Nor, indeed, is the present surface of the island large enough to collect rain-water for the erosion of its lofty caves, attaining as they do a height of 60 feet and more. I am inclined to accept the proportions of the caves as strong evidence that in recent geological epochs, Capri did not receive the drainage from an extensive land surface for long, but was either an island, as it is now, or the extreme end of a narrow promontory.

Evidence of Land-levels to be derived from Caves.—A type of the many smaller caves at the water-level is the Grotta del Lupo, which is known for the gurgling noises which the waves produce in its confined recesses.

A similar cave is the Grotta degli Stalactiti,[*] between the Marina Grande and the Blue Grotto, and accessible only to the swimmer, owing to the low entrance. The long stalactites hanging from its roof bear witness to a long period of tranquillity within, for spray would have prevented their formation.

Passaggio della Stella.—As an example of a more extensive result of marine erosion, we may cite the passage through the Stella or inner Faraglione rock, which is large enough for fishing-boats to sail through. The height of this passage corresponds to that of the low land-level, which is clearly indicated by the undercutting upon the sides of the Faraglioni themselves. The floor of the passage is far below the surface of the water. At the east end the depth of water is 13·08 metres; in the middle, 18·38 metres; and at the west end, 19·30 metres.* We believe that these soundings indicate that the Faraglioni once stood at least 13 metres higher above the water than they do now.

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[*] There is another Grotta degli Stalactiti high up upon the side of the hill of St. Michele, near the church of St. Croce.

Grotta Azzurra.—The precipices of Anacapri fall into the sea from a height of some 600 feet, and the sheer rock is continued beneath the water for a further 120 feet. Towards the west this wall of limestone does not rise as high above the water, although the adjacent soundings are still so deep that the 100-metre isobathic line approaches to within 200 metres of the shore, closer than at any other point round the Bay of Naples, and only surpassed at the Pta. Carena.

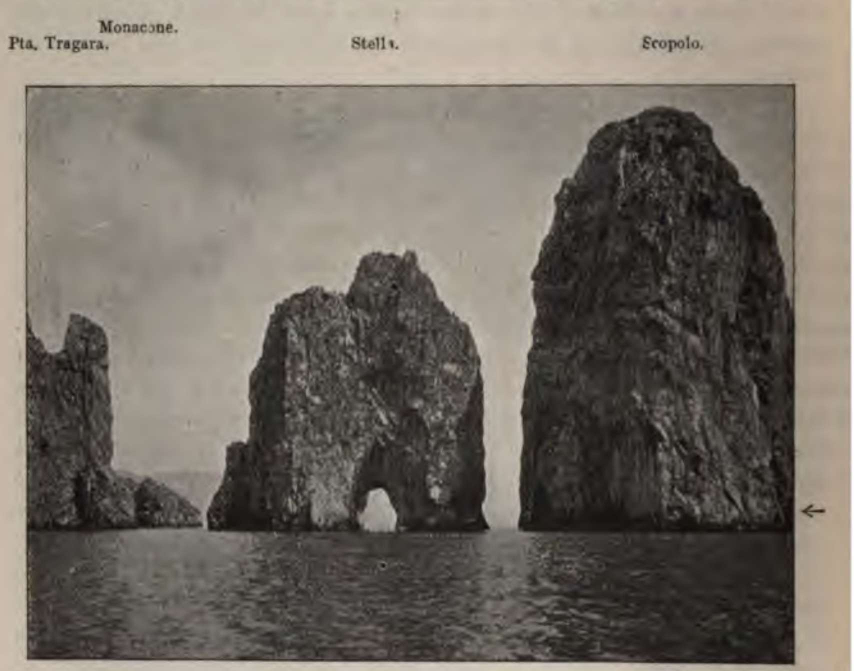

FIG. 4.—THE FARAGLIONI.

(*From a photograph by Brogi.*)

The arrow indicates the upper erosion line, best seen between Stella and Scopolo, about 23 feet above the water-line.

Here, under cliffs of no great height, but above water of great depth, is the chief glory of Capri—the Grotta Azzurra.

The present entrance to the cave is of the size and shape of an ordinary doorway, but, inasmuch as some 3 feet of this entrance are under water, an aperture barely greater than a yard square remains above water for the passage of the diminutive boats specially built for the navigation of the grotto. The floor of the entrance projects outwards for several feet, forming a platform. The passage is only possible in a calm sea, although the water within is stated to remain tranquil by some who have been caught there during a storm. From without the aperture is hardly discernible; and indeed, were it sufficiently large to admit any great volume of light, the glory of the grotto would depart. In fact, the blueness is seen to the greatest advantage when a screen intercepts the direct light from the entrance.

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* These soundings were taken in the middle of the waterway at my request, on October 4, 1902, by our vice-consul, Mr. Harold E. Trower.

The discovery of the grotto in recent times is frequently attributed either to a fisherman, Ferrara by name, and two Englishmen in 1822, or to Kopisch in 1826, who wrote a fantastic account of his exploration, and of the difficulty of allaying the superstitions of the fisherfolk with regard to it. It is to this little narrative of Kopisch that the great fame of the Blue Grotto owes its birth. For the real discoverer, however, we must go three centuries back to Capaccio, who mentions it in his History of Naples of 1607. In 1701 it was visited by Joseph Addison; and in 1727 Parrino attributed its peculiar character to the reflection of light.

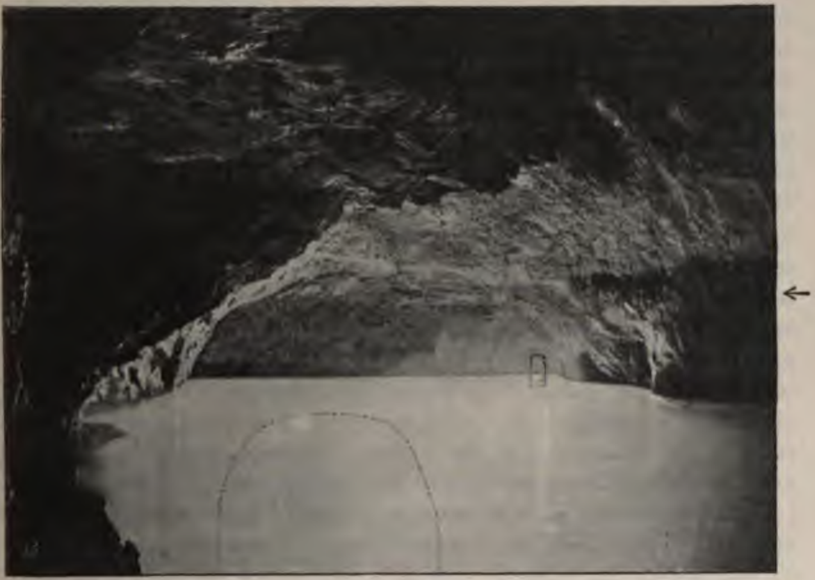

FIG. 5.—THE BLUE GROTTO.

(Adapted from a photograph by Sommer.)

The dotted lines represent the positions and relative sizes of submarine arch and entrance. The arrow marks the upper erosion line, here 17 feet above the water-line.

The grotto is oval in shape, the major axis running east and west. The dimensions are—length 165 feet, breadth about 100 feet, greatest height 40 feet, depth of water 48 feet.* Mangoni gives the dimensions as 170 by 90 by 69 by 69 feet.† The discrepancies are, as might be expected, greatest in respect of the height. The lower estimate of 40 feet seems to us nearer the truth than that of 69 feet, and a large proportion of the vault of the grotto is not much more than 20 feet above the surface of the water. The sides of the cave descend vertically into water which is about 8 to 10 fathoms in depth.

At the side on the right of the entrance to the north-west is a second but entirely submerged opening. The crown of its submarine arch is about 7 or 8 feet below the surface, the width of the opening is about 40 feet, and its height about 50 feet. By this submerged window the grotto receives its wonderfully beautiful light, and it is near the arch that the water has the brightest silvery-blue sheen.

The early explorers were much surprised to discover that they were not the first to enter the grotto. Towards the centre of the back of the cave they found an artificial flight of steps, somewhat broken,‡ leading from below the present water-level to a rocky ledge 3 feet 6 inches above. This ledge is the threshold of an inclined passage which continues some 300 or 400 feet into the rock in a southerly and upward direction. No vestige of building, no tool-marks have been traced upon its walls, and so we must assume a natural origin, probably by aqueous solution of the limestone. The floor consists of a pavement of stalagmitic matter. At first the passage is high enough to be walked along comfortably, but it becomes lower and narrower and several degrees warmer § as it ascends. In the last part progression is difficult, and the way is finally blocked by a square-cut stone, which is supposed to indicate a continuation of the passage, perhaps, to the vaults of the ruined palace of Damecuta, one of the twelve villas of Tiberius.

Such, then, is a general description of the Blue Grotto. The indications which it affords us of ancient water-levels are firstly a number of hollows in the sides of the cave just under the springing of the vault, at a height of 16 or 17 feet above the sea (Fig. 5). These holes are a memorial of the 23 to 12 foot land-level, the level at which the Blue Grotto was finally excavated to its present height.

Next, the ancient steps, continued as they are far beneath the water, indicate a higher land-level at the time of their construction. Where they cease I do not know, but I have heard it stated that they lead down for 20 feet to what we shall consider to be the water-line at the time of Tiberius, and it is very likely that this was the fact. The large aperture would then have allowed free entrance to boats, since its arch would have been at least 12 feet above the surface. It is certain that the Romans knew of and used the cave; it is equally certain that no mention is made of its optical phenomenon by classical authors: the conclusion to be drawn is that the conditions of illumination were entirely different from those of the present day. The cave must originally have been eroded when the land stood at a level higher than at present; perhaps by some 60 feet. A gradual sinking of the land through 40 or 50 feet, followed by an elevation to the Tiberian level, would be sufficient to allow of the erosion of a cave such as the Romans knew.

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* Murray's 'Handbook for South Italy.'

† Reduced from Neapolitan *palmi*, 10·4 inches being taken as 1 palm. Another observer gave 160 by 85 by 50 by 65 feet.

‡ The old Roman steps were renovated about 1890.

§ The thermometer has been observed to indicate a temperature of 100° Fahr. when the temperature outside was only 88° Fahr. (Mangoni).

Grotta Verde e Passaggio Verde.—Near the Green Grotto the coast is rugged and weather-beaten, being fully exposed to the fury of scirocco gales; the wear and tear of the rocks is very rapid, and the marks of former water-lines are not likely to be long preserved. Consequently it is difficult to recognize any definite indication of former land-levels in the Green or the adjacent Red Grottoes. All that can be definitely stated concerning them is that they are sea-caves, the floors of which, formed when the land was higher, are now submerged, but the roofs were eroded when the land was at a level lower than the present by about 20 feet.

The green light upon the rocks seems to be a composite effect due to blue light reflected and transmitted from the water, playing upon the yellowish-hued sides and roof of the cave. It is best seen in the lower Passaggio Verde, which may be traversed by boat on a calm day.

Grotta Bianca.—The White Grotto derives its name from the white incrustations of calcareous matter upon its sides, and from the clusters of white stalactites which hang from the roof and fringe the entrance. The cave faces east, and is situated near the Pta. della Chiavica. The vestibule, about 70 to 80 feet high, leads into upper and lower caves, of which the former is not easily accessible. There is no record of its having been visited at all before Lieut. Kennedy, R.E., in 1901, by sending a boy up the long yard of a lateen-rigged boat, which was moored alongside, got some ropes fixed into it. He was thus enabled to climb up.

The lower cave can be entered by boat for a short distance. Unlike most other caves at the water-level, it is much broader at some 6 feet above the water than actually at the surface. The total height is not great in proportion, being only 24 feet or less.

The upper erosion-line is very clearly marked near this cave, and is also noticeable within it. The upper cave seems to belong to an earlier period.

Grotta dell' Arsenale.—This cave owes its name to a tradition that it was used in the time of Tiberius as a depôt for naval stores. It measures 130 feet long by 100 feet wide by 50 feet high. Excavations made in 1777 in the shingle, which still covers the floor to a depth of from 4 to 5 feet, brought to light traces of the walls of two or three rooms of Roman workmanship; a floor of coloured marbles, and some iron fragments which have been identified as part of the plant of the ancient naval station, or perhaps of a Roman galley. Although the floor of the cave is quite 8 feet above the sea, in southerly gales waves dash in with such violence as to render its use as a storehouse out of the question. The walls unearthed here indicate, therefore, that at the time they were built this cave stood higher above the sea than it does at present, and the conformation of the rocks is such that an elevation of 15 feet would place the floor beyond the reach of all but the most exceptional storms.

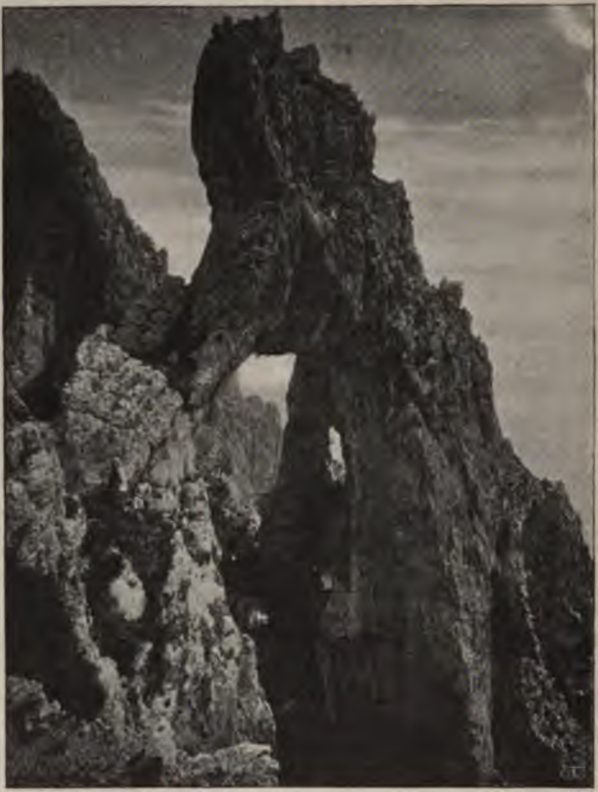

FIG. 6.—ARCO NATURALE.
(From a photograph by Brogi.)

The cave itself seems to have been formed by marine erosion when the land-level was at least 8 feet lower than it is at present—at a period which must have been much anterior to that of the Roman times.

As evidence of a still greater submergence of Capri, we may mention those large and lofty caves which are found at a height sometimes of 700 feet above sea-level. All are relatively shallow, and appear to be the result of marine erosion. It is difficult to estimate with any accuracy the time required for so great an upheaval. We can only know that it is so recent that the combined forces of wind and weather have not succeeded in obliterating all traces of marine erosion.

Arco Naturale, Grotta di Matromania.—High above the sea, on the steep pile of rocks which rises from a small cove facing east, is a most remarkable natural arch, which, like the passage through the Stella, seems to have been eroded by the sea.

At a little distance from the arch is the Grotta di Matromania, Mitromania or Matrimonio, a large natural cavern of about 90 feet long by 60 feet wide by 60 feet high, which seems to have been a fane of Mithras, whose name the grotto still bears.

The Grotta del Castiglione is a lofty cave high up in the hill of the same name, facing south. When the inhabitants of Capri took refuge in it at the time of the Turkish raids there was a way to it from the east, but the path has since been destroyed by the crumbling of the cliff.

Grotta dell' Arco.—A large shallow cave facing east, under the cliffs south-east of the Castello di Barbarossa. In height it is about 85 feet, and it is situated at about 800 feet above sea-level. We are not quite satisfied that the Grotta dell' Arco is a sea-cave, and rather incline to the belief that it may have arisen as a result of the great landslip which occurred at the east of Monte Solaro.

Other similar elevated caves are the Cocuzza, Tiberio, Grotta delle Felci, and others under Monte Solaro.

It might well be argued that such a great alteration in the level of Capri as that supposed must have to some extent affected the neighbouring mainland, and we find that on the hillsides of the Amalfi coast there are also large caverns, similar in appearance, situation, and aspect to those we have just enumerated.

Evidence of Land-levels to be derived from Ancient Buildings.—In many places around the coast of the Bay of Naples, Roman ruins are to be seen very near the water's edge, and, if not dipping in the sea, often so close to it as to be exposed to the ravages of every storm. In accordance with the theory of alteration in land-level we believe that the buildings were originally constructed and occupied at a higher level, and have been carried down by the land as it subsided. Such buildings may, therefore, afford us valuable assistance when we endeavour to date the land-movements and to estimate the time of their duration.

Palazzo a Mare.—By far the most extensive Roman remains upon the Capri littoral are those known as the Palazzo a Mare, one of the largest of the twelve villas of Tiberius, and therefore dating from about 27 to 37 A.D. The buildings not only covered considerable ground on the top of the cliffs, which were buttressed by strong walls, but also extended down to the beach, where the north wing was thrown out towards the sea, and must have made a charming abode in summer. As seen from the sea, a semicircular exedra of *opus reticulatum* halfway up the face of the cliff is one of the most conspicuous features of the ruins. It is built so as to cover the middle third of the height of the cliff facing Vesuvius. Many fragments of walls lie in the water below, having been undermined by the sea; but as they have fallen from uncertain levels, they do not supply us with data as reliable as those to be derived from the western portions of the building still *in situ*.

To the north-west of the exedra, and standing partly upon a little beach, partly in the water beyond, are more remains of this northern wing of the palace, the massive ruins well known to the boatmen as the Bagni di Tiberio. The best-preserved portions are the lower walls of a large rectangular room, measuring about 50 feet from east to west, which seems to have been open on the east. The southern wall, curved and apse-like in shape, is all built of limestone (*opus incertum*), except one small course of tufa, which may be seen near the upper part of the east end of the wall. The greater part of the top has been levelled to a height of about 15 feet from the present surface of the water (Fig. 7), but the east end stands up some few feet higher. It has already been suggested that the wall was cut down to the present height at the time of the erosion of the 23 to 12 foot groove. The north and west walls, being more exposed, have been much more worn away, notwithstanding their remarkable thickness of 27 feet. The inner 15 feet are of limestone, and appear to be of the same age as the south wall; but at a later date an outer casing of tufa of about 12 feet was added, perhaps against the encroachments of the sea.

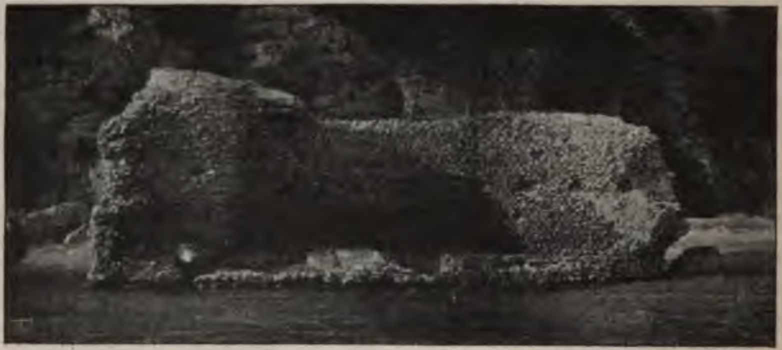

FIG. 7.—BAGNI DI TIBERIO. SOUTH WALL.

The original pavement of the room, about 1 foot above the present surface of the water, has been almost wholly washed away, thus exposing a drain, which opens on the north wall at about 6 feet under water. The existence of this drain, as well as of pipes running in the walls—one near the north-west angle is continued for 7 feet below the surface of the water—is clear proof of the subsidence of the buildings. Near by are portions of walls belonging to other and smaller rooms less well preserved and also under water. The partial submergence of these walls has led to the belief that the lower part of the building was originally used as a sea-bath—an interpretation which is commonly given for other partially submerged Roman buildings round the Bay of Naples. Now, although some of these submerged buildings may have been built as bathing-establishments, we must be cautious in accepting any interpretation depending solely upon the present level, for often the structural characters of the ruined walls show them clearly to have been built well above water.

Cloaca.—The end of a Roman sewer may be seen at the west of the Grande Marina. It seems to have drained a considerable part of the northern side of the island, to judge from the discovery of many smaller drains which are believed to have led into it. The fall of the sewer has been greatly changed. Instead of having a gentle gradient from south to north, it now dips steeply in the reverse direction, viz. north to south at an angle of 25°. This reversal of incline has occasionally been cited as evidence for the alteration of the land-level of Capri since the Roman period. And such evidence it undoubtedly is, but the large angle through which the drain has been tilted, the broken nature of the end of the cloaca, and the occurrence of perfectly undisturbed and upright ancient walls at no great distance, point to a change of level more local and violent than those gentle and widespread earth-movements which are the more immediate subjects of our paper.

The dislocation of the sewer was probably the result of a landslip which did not affect the land on either side. The walls of the Palazzo a Mare, though now standing at a lower level than when first built, are still plumb, which could hardly have been the case had they been involved in the landslip. Again, on the other side of the cloaca, the old Roman aqueduct near the middle of the Grande Marina has preserved its form and level sufficiently to be still carrying off the overflow waters from the fountain. The aqueduct, however, seems to have suffered from earthquakes, as does a large building which was discovered near the fountain in the reign of Francis I.; the walls were badly cracked, and the vaulted ceilings were found to have fallen.

An explanation for the remarkable tilt of the cloaca which is given by some writers on Capri is that since it was laid, the subsidence of a large area (between San Michele and Mte. Solaro) has taken place. Indeed, Captain Mackowen has gone so far as to make a calculation, from which it would seem that the land near the watershed above the cloaca must have sunk 150 metres to produce the required inclination. But we doubt whether it has been proved that the sewer continues in a straight line for a great distance and at the same tilt. It is more likely that the terminal portion of the sewer only has slipped and taken a steep inclination. Therefore we cannot fairly argue about the direction of the earth-movements over such a large area as is involved in the calculation of Mackowen.

The Ancient Harbour and the Theory of Subsidence.—No discussion of the data relating to the ancient sea-levels of Capri would be complete without some mention of the ancient harbour which was used during the period of the Roman occupation of the island, since the two subjects are closely connected.

At the present day the traffic of the island is chiefly carried on on the north side, under the shelter of a little modern breakwater jutting out from the Marina Grande. The anchorage is anything but safe. On the southern shore there is no anchorage at all, for the deep water comes close to the rocks, and so the few fishing-boats kept at the Marina Piccola have to be hauled up.

Now, Suetonius * distinctly refers to the existence of a port of Capri, and of one only. The breakwater of the Marina Grande did not exist, nor have any other ancient harbour works hitherto been pointed out on the northern side. Mangoni and others have tried to show that the harbour alluded to by Suetonius, which the needs of an Imperial household in residence rendered necessary, may very probably have existed on the south coast.

The site which is the first to suggest itself to the hydrographer is the Porto Tragara. This little cove is thoroughly sheltered on the north by the island, on the west by the Pta. Tragara, and on the south-west by the Faraglioni; on the other hand, it is open to the south and east, and the rocky islet Monacone is a very insufficient barrier against the full force of a scirocco. Certain archæologists have accordingly expressed a view that a breakwater must have extended between the inner Faraglione and the Monacone, and that this has been destroyed either by subsidence of the land, earthquake, or marine erosion. The soundings between the rocks, however, do not tell in favour of this view, the water near the middle of the supposed barrier being close upon 25 fathoms deep. There is no clear evidence of any cataclysmic subsidence having occurred here in recent times; indeed, the fact that the upper water-line upon the rocks is in a uniform plane tells against the theory of local and sudden subsidence.

On the other hand, there are remains of large masonry walls, which are said to extend down to a depth of 22 feet near the Punta Tragara, on the western side of the supposed harbour. Lead pipes for the purpose of leading down drinking-water from reservoirs above have also been found, and they, together with the discoveries in the Grotta dell' Arsenale, are all evidence corroborative of the existence of a naval station of some sort.

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* "Quod uno parvoque litore adiretur, septa undique præruptis immensæ altitudinis rupibus et profundo mari."—Suetonius, 'Tib.,' 40.

If it be granted that the land stood higher out of the water in Roman times than at present, it follows that the anchorage would have been less deep, the water-passages between the rocks narrower, and the harbour more sheltered from wind than at present. But still we doubt if the Porto Tragara could have been rendered safe in all weathers without the construction of a breakwater to the Monacone. The foundations of an engineering work of such dimensions could hardly have entirely disappeared. Some traces would assuredly have resisted the encroachments of time, even as other Roman works in not less exposed situations have done. Roman galleys may have had moorings there during the season of settled and tranquil weather, and for this purpose the natural protection afforded by the three rocks (it has been suggested that Tragara = *Τριάκρα*) may have been increased by some arrangement of floating booms between them, so as to mitigate the force of the waves. But until conclusive evidence of traces of the breakwater are forthcoming, we prefer to disbelieve that the Porto Tragara was ever made a safe anchorage.

There are many indications that the land is at a lower level than when the submerged walls were built. West of the Pta. Tragara, and near the Unghia Marina or Albergo dei Pescatori, a flight of steps, partly masonry, partly cut in rock, may be perceived about 10 or 12 feet below the water. These must have been above water at the time of their construction.

A little further west, on the tiny beach known as the Marina di Mulo or Piccola Marina, are submerged Roman constructions which were considered by Mangoni to have formed part of the Mulo or mole, and of other works of the naval station, which he believed to have extended from the Pta. di Mulo to Tragara. The depth of the water is certainly far more favourable for breakwater construction than at Tragara, and it is possible that some ancient works may lie buried beneath the shingle and *débris* of the Marina Piccola, but it is highly improbable that the principal harbour would have been on the weather side of the island. Beloch has taken the view that the "one small shore of access" was the Marina Grande. While doubting his premiss that the modern breakwater has rendered the Marina Grande an entirely safe harbour, and that therefore it must also have been safe in the days of the Romans, we agree with him in believing that the ancient town of Capreæ would have stood near the landing-place, for it was founded by a sea-faring people. The ancient Greek steps leading to Anacapri, and the old cathedral of S. Costanzo, of the first century A.D., are both valuable indications of the position of the old town. And we find an additional support for the view in the local tradition that the lower town had to be deserted because proximity to the sea rendered it subject to the raids of pirates.

All this evidence is strongly in favour of the principal landing-place being on the north side of the island, and it is there that we are inclined to seek for traces of it. Lying submerged in the beach and sea are some large squareish masses of masonry, which are commonly stated to be the end of the cloaca. But in their arrangement and appearance these structures are so like the breakwaters of the Roman harbours of the mainland (*vide infra*), that we have no hesitation in identifying them as the western mole of the ancient harbour of Capri, which has become filled up with sand and *débris* from the cliffs above. Doubtless the landslip which dislocated the cloaca contributed to the obliteration of the harbour. The upper part of the mole would, of course, have stood high above the water in the Tiberian period.

CONCLUSIONS WITH REGARD TO THE MOVEMENTS OF CAPRI.

1. Whereas there is abundant evidence that the land of Capri has undergone very considerable changes in position, there is no evidence that the level of the sea has altered.

Therefore all former water-lines are more logically interpreted as indicating changes in the level of the land rather than changes in the level of the sea.

2. The land has remained nearly stationary at its present level for a period long enough to allow of the formation of the marks of erosion along the present water-line.

3. At some previous epoch (post-Roman) the land also remained stationary in a lower position at the level indicated by the 23 to 12 foot water-line, *i.e.* the land has risen 23 feet at the east end, but only 12 feet at the west end of the island.

Effects—Erosion of upper water-line.
Levelling of walls of Bagni di Tiberio.
Erosion of roof of Blue Grotto and of interior of lower White Grotto.
Erosion of arch of Stella.

4. The Tiberian land-level was about 20 feet higher than the present. The land must have been at a level sufficiently high to raise the large aperture of the Blue Grotto partially above water, and to lift all low sites with Roman buildings, such as the Grotta Arsenale, sufficiently to make them suited to their purpose.

5. At a still earlier epoch the land must have been at a level high enough for the erosion of the floors of the Blue Grotto, of the Stella passage, and of all other partially submerged caves.

6. The land must have been at levels low enough for the floors and

roofs of all elevated sea-caves to have been awash. Thus the land must now stand higher by the altitude of the caves above sea-level.

Effects—Erosion of floor of Grotta Arsenale, and of widest part of Grotta Bianca.
Erosion of upper cave of Grotta Bianca.
Erosion of Cocuzza, Grotta Matromania, Arco Naturale, cave at Amalfi, elevated caves under Monte Solaro, etc.

II.—THE SORRENTINE PENINSULA.

The Sorrento of to-day is perched high above, but overhanging, the sea on the edge of a tufa plateau, which lies in a cradle of limestone hills. The sea, ever gnawing into the foundations of the tufa, has helped to produce a perpendicular escarpment, in consequence of which the plain of Sorrento falls away to the north abruptly in vertical cliffs, some hundred feet in height.

Here and there the torrents from the mountains behind have left great ravines in the tufa, which, like the valleys in the Camaldoli hills, are cañon-like, with nearly vertical walls.

Under the cliffs are a few beaches separated by intervening water of no great depth, covering a sandy bottom. Below Sorrento itself, one of the more extended beaches is used as a landing-place, and is protected by a quay and a breakwater, inside which a few vessels can find shelter on what would otherwise be a dangerous coast in certain winds.

The Lower Town.—In times gone by the sandy shore was more extended than it is to-day. Fishermen tell how it was once possible to walk dryshod beneath the steep rocks from the Grande Marina to the Piccola Marina. More positive evidence is afforded by the many foundations and walls of ancient buildings which now lie submerged beneath the town, but which must originally have been built on dry land. Their splendour is indicated by the almost inexhaustible supply of fragments of fine marbles and mosaics which are thrown up on the beach after every storm.

An entire suburb of the Roman Surrentum seems to have stood on the strand at the foot of the cliffs, between the two Marine, and to have stretched as far east as the Punta di Circe. Among others which have been traced were a room of *opus reticulatum* with a mosaic floor, now destroyed by the Calata of the Villa Tre Case (Hotel Croce di Malta); foundations of *opus lateritium*, on which the custom-house of the Piccola Marina now stands; the foundation of a rectangular building now under water, and many broken cipolline columns used for mooring vessels at the Piccola Marina. In the direction of the monastery of S. Giorgio, four other buildings may be seen beneath the sea, in water which is there but a few feet deep.

The many artificial caves also bear witness to a more extensive foreshore.

A typical one is the Grotta di S. Giorgio, which, owing to the subsidence of land, has now to be visited by boat, the floor being 1·1 metre below water. The ceiling is vaulted, and there is a niche in the end wall. Although commonly called a "bath," there is a tradition that this grotto was once used as a "church."

In ancient days the commercial centre of the town was probably here close to the magazines and warehouses, and near by must have been the Temple of Venus which is mentioned in the lines—

> "Adsis, o Cytherea, tuus te Cæsar Olympo
> Et Surrentini littoris ora vocant."
> Pseudo-Virgilian Epigram, Catal. vi.

Bagni della Regina Giovanna.—We have at the Capo di Sorrento what may be considered a monument to the changes in land-level, in the ruin popularly known as the Bagni della Regina Giovanna, but undoubtedly a Roman building on the property of Pollio Felix. It is worthy of attention, for it gives us more positively than do the Roman ruins at Capri, the approximate period within which the land remained at the low level already referred to as the 23 to 12 foot level of Capri.

This building is doubly interesting, because it seems to be one of the very few on the Bay of Naples of which we have any description in classical literature. The romantic position provoked the admiration of Statius, and called forth the lines—

> "Dat natura locum montique intervenit unda,
> Litus et in terras, scopulis pendentibus, exit.
> Gratia prima loci gemina testudine fumant
> Balnea, et e terris occurrit dulcis amaro
> Nympha mari. levis hic Phorci chorus, udaque crines
> Cymodoce viridisque cupit Galatea lavari."
> Silv. ii., 2, 15-20.[*]
>
> "Curvi tu litoris ora
> Clausisti calidas gemina testudine nymphas."
> Silv. iii., 1, 100.[*]

A narrow passage leads from the sea, under a rocky arch, into a round basin filled with crystal clear water. The basin is surrounded by a rocky wall, about 40 feet high, and may once have been a natural cave in the limestone, of which the roof has fallen in. The Romans lined it with masonry and vaulted it over. The *gemina testudo* has fallen, leaving the bath open to the sky, and large fragments of masonry may be seen lying at the bottom of the pool.

We believe that this building originally stood higher above the sea than it does now, because the springing of the vault near the entrance shows that the ceiling, if perfect, would be nearer the present surface of the water and the room lower than a sense of good architectural proportion demands. If we may assume that the height of the bath was originally in a good proportion to the width, as it is in the other imilar round buildings at Baiæ, etc., we have an indication that the nd here is lower than it was when the building was erected. Con-

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[*] Other texts have "lympha" and "lymphas" instead of "nympha" and "nymphas."

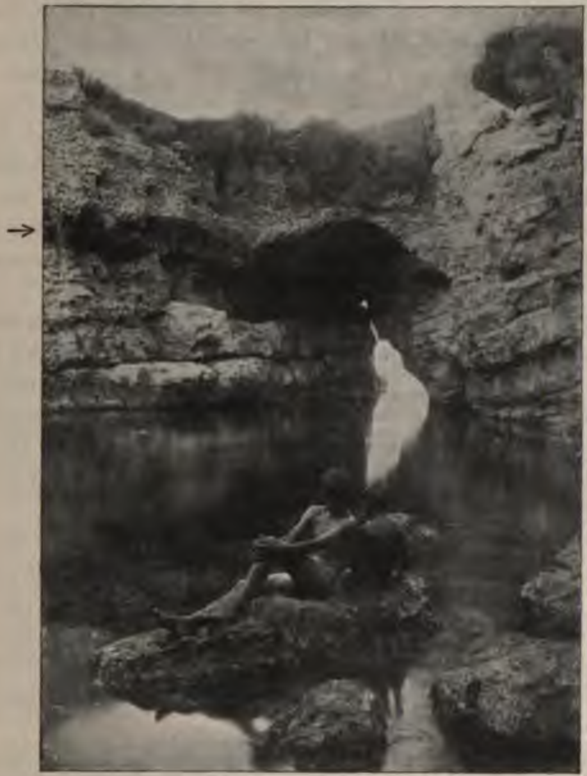

FIG. 8.—BAGNI DELLA REGINA GIOVANNA.
(From a photograph by Plüschow.)
The arrow indicates the upper line of erosion, 18 feet above the present water-line.

rmatory evidence is afforded by a strongly marked undercutting of he rock walls of the entrance, now at a depth of some 16 feet under water, which we believe to be due to abrasion by shingle. There is lso a slight undercutting on the sides of the entrance, at about 5 feet below the surface of the water.

Convincing proof of post-Roman rise of land-level is also to be found upon the building, for at 18 feet above the water-level, near the springing of the vault, is an upper line of erosion marks. The same line may be seen at various places along the north side of the promontory, and also below the Martello tower round the point.

Our conclusion is, that the building known as the Bagni della Regina Giovanna was at least 16 feet higher above the sea-level, and instead of containing deep water may even have had a dry floor, and have been used as a hall or apodyterium in which bathers could lounge between their baths.

While the land was still standing at this level the sides of the entrance were worn away by the shingle rolled by the waves. The land then sank 34 feet, remaining stationary for a brief space after it had sunk 11 feet, thus allowing for the second undercutting. The upper line of erosion marks was then made, and the land has since been raised 18 feet, and has remained there for some time. The oscillation has, in fact, been similar to that of Capri and of the temple of Serapis, and to one which has affected the mainland as far north as Gaeta,* but the magnitude of the movement has varied somewhat in the different localities.

Submerged Caves between Sorrento and Meta, believed to have been Ancient Quarries.—Under the tufa cliffs between Sorrento and Meta are some large and partially submerged caves. In the Grande Grotta nearest Meta, the depth of water is from 4 to 5 metres, both in the main chamber and in the small side entrance of the cave; the bottom is sandy. Outside the cave the depth of water is 6 metres at a distance of some 4 metres from the cliffs.

The next cave has two entrances, narrower and lower than those of the first. The water is 4 metres deep. In the third cave the depth of water is 5 metres. The next, the Grotta della Campana, has a broad beach 23 metres long, and the general appearance and inclination of the walls lead one to believe that the cave was originally lower, but not much less spacious than the other caves, but that it has become partly silted up.

Now, the tufa rock does not become eroded in such a manner as naturally to give rise to spacious caves, and consequently we believe these large caves below the plain of Sorrento to have had an artificial origin. An elevation of 5 metres would place their floors above water, and would make it possible for a cart to pass along the foot of the cliffs to the seaport, and so the conclusion is that they were quarries whence the Romans drew the hard tufa of good quality for the many buildings which stood upon the then extensive foreshore.

Evidence of Former Land-levels from the Amalfi Coast.—It is only to be expected that the southern shore of the Sorrentine peninsula should have accompanied the northern in its alterations of level, and the elevated sea caves have already been explained as the result of the same low land-level as that of the elevated sea-caves of Capri.

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* The peculiar shape of the mushroom rock at Lacco, Ischia, seems to be partly due to the same low land-level.

To Amalfi, the headquarters of the Eastern trade in the eleventh century, and perhaps also to the juxtaposition of the University of Salerno, we owe one of those rare early records of subsidence which help us to fix the dates of the post-Roman earth-movements. The submergence of the greater part of a town of 50,000 merchant-mariners, who steered by the compass,* was not an event to be left unrecorded by the chroniclers,† and so we learn that the "inundation" of Amalfi occurred before 1140, the date of Andrea Mola, and probably after the period of the greatest prosperity of the city. No wonder that after such a catastrophe, though gradual, the city was not able to withstand the arms of the Normans, and finally fell a victim to the ambition of Pisa.

III. COAST OF POSILIPO.

The next portion of our evidence has been derived from the coast of Posilipo, which we have studied with the object of ascertaining, as nearly as may be, both the actual level of the land during the Roman dominion, and the form of the ancient coast-line. Except at the end nearest to Naples, where the natural contours have been much disguised by buildings, the structure of Posilipo may be easily perceived.

The tufa slopes of Posilipo are seamed like a well-drained field, with ridges and furrows running at right angles to the long axis of the ridge, which extends from north-east to south-west. The coast-line is undulating; little coves or *cale* alternate with diminutive headlands, corresponding respectively to the furrows and ridges of the slopes. The beds of tufa are of varying hardness, therefore the progress of erosion has been very unequal. The detritus from the cliffs forms sandy beaches in the *cale*, and all sheltered spots, such as artificial harbours, tend to become rapidly silted up with sand drifted along the shore from south to north. At no place is the water near the shore very deep, and the 3-metre line of soundings is far enough from the base of the cliffs to admit the possibility of a road, if the land were raised a little above its present level. A rise of only 6 feet would make it possible to walk along the shore from the town to the Capo di Posilipo.

The Upper Erosion-line.—At many points along the shore the upper groove of erosion is very marked. It does not preserve that absolute straightness which we have noticed in Capri, where the limestone is of uniform hardness; the course of the groove, being partly determined by variations in the hardness of the beds of tufa, rises and falls, so that it is often difficult to determine the precise position of the land-level at the time of the greatest depression. Above the groove of erosion the surface of the rock is honeycombed by weathering, below it the rock surface is fairly flat, an instance of preservation by immersion.

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* ". . . hac plurimus urbe moratur
Nauta maris cœlique vias aperire peritus."
Gulielmus Apulus, iii. p. 267.

† "Civitas Amalphia erat major ut est in præsenti, quia major pars ipsius propter inundationem maris est deleta et jacet intus mare," quoted from Andrea Mola di Tramonti by Niccolini. The event has been recorded in verse by Matteo Camera.

Effects of Subsidence.—Our evidence that the land is at a lower level than in classical times is chiefly derived from the many Roman buildings which lie submerged along the shore.* There are rooms with floors awash or beneath the surface; ancient plaster is to be seen still adhering to submerged walls, and passages tunnelled through the rock are now entirely filled with water. It is necessary to enlarge upon these submerged ruins, because they have generally been regarded merely as foundation walls thrown out into the sea for baths, landing-places, and other such purposes, and that, therefore, they are not to be regarded as evidences of the subsidence of land.

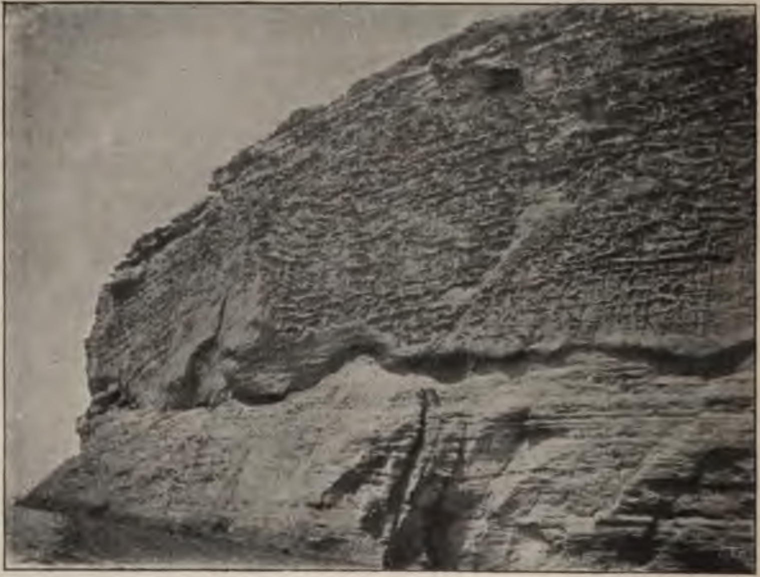

FIG. 9.—TUFA CLIFFS ON EAST SIDE OF NISIDA.

Showing the difference between a surface below the upper erosion line, which has been preserved by submergence, and a surface above, which has been weathered.

We disagree with this view, though acknowledging that some of the structures furthest from the shore and in the deepest water may have originally been erected in the sea, like the works referred to by

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* Described in a paper read by the author before the Society of Antiquaries on January 22, 1903, and shortly to be published in *Archæologia*.

Horace, "Although possessed of greater wealth than the untouched treasuries of the Arabs and opulent India, you were to overspread with your piles of rubble all the Etruscan and Apulian sea. . . ."*

The work of exploration was not easy: it is always difficult to make out the true form of objects under water even in a dead calm, and in a slight breeze impossible without a water-telescope. Reflection and refraction conspire against the observer. Nor are they his only *bêtes noires.* Currents may drift boats and buoys from their stations, and disturb orientation. If buoys left to mark positions be not carefully watched, some meddling fisherman may move them or "lift" them altogether. Once, when sounding between the ancient piers of the harbour of Misenum, my operations were stopped by a suspicious coast-guard officer; and last, though not least, the gas-lit buoy which marks a dangerous shoal off the end of Posilipo was moved by an officer of the port of Naples from the place indicated on the charts of the Uffizio Idrografico, thus rendering a number of position angles based upon it worthless.

Most of the work was done in the early morning, before the day wind ruffled the surface of the sea. Lines of corks at measured intervals were floated on the surface vertically over the walls to be measured, and their positions were fixed with the help of a theodolite on land. Much assistance was derived from the local shore-fishermen and divers for shellfish, whose livelihood depends largely upon an intimate acquaintance with the *chiane* and *scogli* (shoals and rocks), presently to be described as Roman ruins.

Throughout we were impressed by the good state of preservation of many of the ruins, which shows that next to no erosion takes place at a small distance beneath the surface.

We believe that we can demonstrate that the principal effects of the subsidence of the Posilipo foreshore are—

1. The submergence of considerable tracts of land upon which many Roman, and probably Greek, buildings were erected.
2. The destruction of the ancient coast-road between Puteoli (Pozzuoli), the submerged regions, and Neapolis.
3. The flooding and isolation of the ancient quarries near the southern extremity of Posilipo.
4. The sinking of an ancient harbour, so that the breakwaters are now covered by 2 fathoms of water, and are therefore useless.

1. *The Ancient Buildings on the Foreshore.*—The most perfectly preserved of the ancient buildings which are now actually washed by the waves, but which must have been high and dry during the Roman period, is the Casa degli Spiriti. There are some 6 to 8 feet of water in the basement now, although at the time of the lowest land-level

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* Od. iii. 24; *cf.* also Od. ii. 18, and Od. iii. 1.

the water reached high up the walls of the first floor, and has left an erosion-line inside the rooms at a height of 16 feet above the present level. It is astonishing that this house should have survived so many centuries, but of its antiquity there can be no question, since the erosion-line and the *opus reticulatum* of which it is built are sufficient to convince the geologist and the archæologist independently.

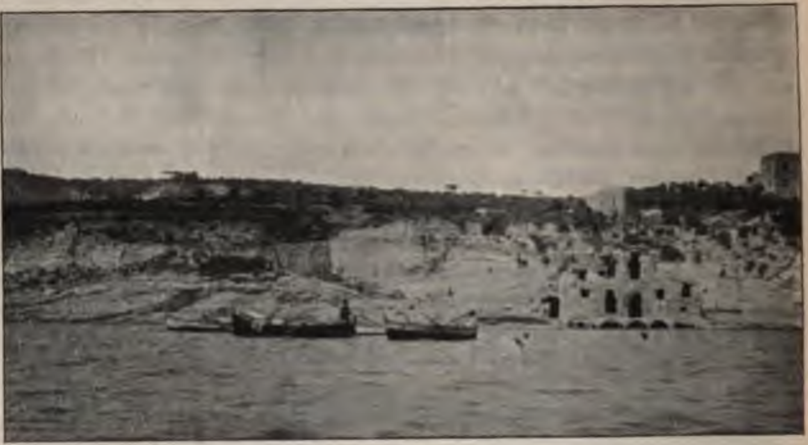

FIG. 10.—LA CASA DEGLI SPIRITI.

A still larger Roman house once stood upon the beach below the fishing village of Marechiano. The walls of the ground-floor rooms are still standing, but the greater part do not reach the surface of the water. A few of the apartments have been used by fishermen as aquaria for keeping live fish, and so a tradition has arisen that in these ruins we have the remains of the fish-tanks of Vedius Pollio, and doubtless many a franc has been earned by the cicerone who could point out the particular tank in which were kept the pampered murænas that were fed upon slaves. However, other artificial constructions in deeper water prove that these so-called fish-tanks must have been high and dry in the Roman period. For a description of other instances of submerged houses near the shore, we must refer the reader to our archæological paper, and will only mention the two submerged regions off the villa belonging to the Earl of Rosebery and off the Gaiola.

The former lies just beyond the Capo di Posilipo, and inside the Pietra Salata; it is a tract of sea-bottom of some dozen acres in extent, upon which there are still standing several foundations of buildings within an ancient sea-wall, and protected by concrete piers 17 feet high, the tops of which are some 2 fathoms below the surface.

All round the Gaiola islets, and extending seaward for the best part of a quarter of a mile from the mainland, are submerged shoals which must undoubtedly have been out of the water when the many buildings standing upon them were erected. We have been able to find traces of artificial work, at a depth of 13 feet, which seems once to have been above water, while artificial piers rise from water of about 4 fathoms. It is quite possible that we have lit upon the forgotten site of the old Greek colony of Parthenope, which became Palæpolis when Neapolis was founded; for the extremity of Posilipo is just such a site as the Greeks would have chosen.

2. *The Forgotten Coast Road.*—Along the greater portion of the Posilipo shore the low cliffs now rise directly from the water. The evidence of the former existence of a road under the cliffs on the edge of the sea is derived partly from the absence, until quite recently, of any proper means of communication between the many ancient buildings which line the shore; partly from the existence of ancient columbaria along the supposed course; and partly from the occurrence of several ancient tunnels or cuttings piercing the more exposed headlands, through which the road is believed to have passed. The floors of two of these ancient tunnels are now some 6 feet under water. Such a coast road would not only have afforded means of communication between the Gaiola (Palæpolis?) and Rosebery regions and Neapolis, but would also explain the purpose of the tunnel of Sejanus through Coroglio, 844 yards in length, and with a larger cross-section than the Grotta Vecchia, a tunnel made to carry all the traffic between Puteoli and Neapolis, in the time of Augustus. We have assured ourselves that no material obstacle to the road exists, always assuming that the land-level was at least some 10 feet higher than at the present day. The ancient coast road, on emerging from the tunnel of Sejanus, would have followed the Vallone di Gaiola to the head of the harbour, and then have skirted the sea, passing in front of the Casa degli Spirit and the other Roman houses on the shore, until it reached the region at the Capo di Posilipo, where, after bending to the north-east, it would finally have reached Neapolis.

3. *The Flooded Quarries.*—Under the precipitous cliffs which skirt the Cala di Trentaremi, are several vast caves, which we believe to have been the ancient quarries whence the Roman masons drew their stone for the many buildings along the shore. According to a rough estimate, some 200,000 cubic feet of stone must have been taken out of the cliffs here. The antiquity of the excavations is proved by the continuation of the upper erosion-line into them. The floors of the Grotta dei Tuoni and delle Palumbe are submerged to a depth of 15 to 20 feet, and the distance through which the land has sunk may be estimated by the depth of these old quarry floors below the surface of the water.

Let us state our reasons for thinking the caves to be artificial rather than of natural origin.

a. The tufa rock in which these caves have been excavated does not, like the limestone of Capri, lend itself to natural cave-formation.

β. Caves, when they are due to erosion by water, are widest at the surface of the water. But the walls of certain of the Trentaremi caves, by sloping outwards under the water, make them somewhat wider below than at the surface.

γ. A passage with walls which have been artificially cut by a tool* leads out of the side of the Grotta dei Tuoni, but, being entirely submerged, it has been impossible to follow it.

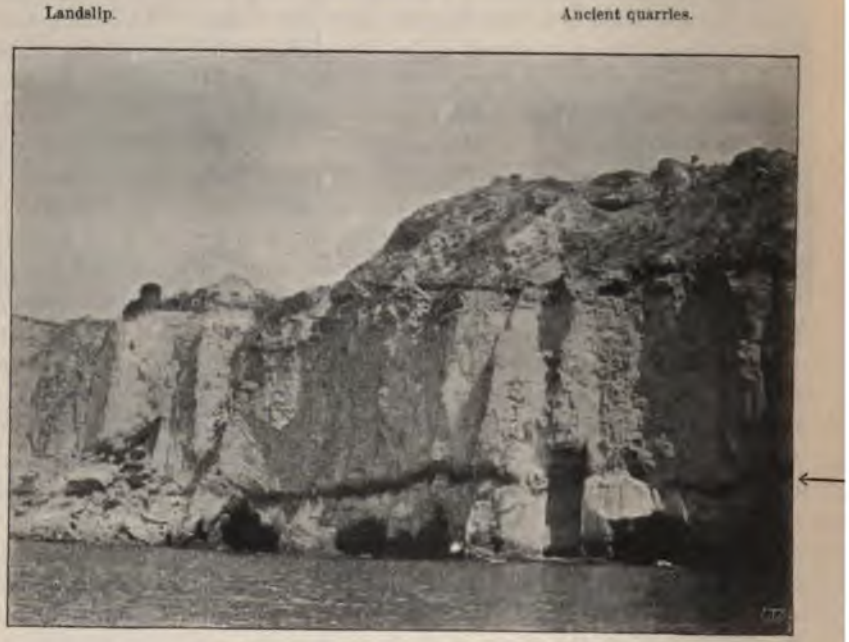

FIG. 11.—TUFA CLIFFS, CALA DI TRENTAREMI.

The arrow indicates the upper erosion line.

4. *The Sunken Harbour of Pausilypon.*—Arranged in line and parallel to the shore are the inner artificial barriers of this ancient harbour. Like the defences of other Roman harbours upon this coast, they take the form of isolated square-shaped concrete piers, known as *opus pilarum*.

The tops of the piers are now 2 fathoms below the surface, although they must have been raised considerably above it when they were built. Further out to sea a group of four piers rises from a depth of 3½ fathoms to 2 fathoms below the surface. These and a shoal beyond marked the entrance to the harbour. If we may assume that the concrete piers were carried up to a height of 4 feet above the Roman water-level, the land must have subsided 16 feet at this point.

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* Reported to me by a diver.

The utility of a harbour at the southern extremity of Posilipo in Roman times is obvious, for there are very many indications of a numerous and wealthy population.

(*To be continued.*)

GEOGRAPHICAL DISTRIBUTION OF VEGETATION IN YORKSHIRE.

By Dr. WILLIAM G. SMITH, Yorkshire College, Leeds, and W. MUNN RANKIN, B.Sc.

PART II.: HARROGATE AND SKIPTON DISTRICT.*

The observations necessary for the present map and survey of the vegetation were made during the same period as those in the Leeds and Halifax district (Part I.). The detailed survey of the western hill region was carried out chiefly by Mr. Rankin. The district lies directly to the north of Part I., the eastern and western boundaries of the two maps being continuous. The western limit lies in the hill mass of Craven, and excludes the Ribble basin on the west of the Pennine watershed. The drainage areas included are those of the Aire, Wharfe, and Nidd, with portions of the Ure and Swale in the North Riding, and part of the Ouse. The north-western part is a plateau, with an altitude from 1500 to 2300 feet (456 to 700 metres), cut up by deep valleys, locally known as dales. Towards the east, the country declines gradually into the Plain of York, which is below 100 feet (30 metres).

The factors which determine the character of the vegetation in this district may be conveniently considered as—

(*a*) Edaphic or Soil Conditions; (*b*) Climatic or Aërial Conditions.

(*a*) *Edaphic Conditions.*—The geology of the area is somewhat complex, and reference to a geological map is advisable. We are indebted to Mr. P. F. Kendall, of Yorkshire College, for the following sketch of the salient features.

“ The rocks of the district exhibit the following succession:—

(7) Trias	Soft red sandstones.
(6) Permian...	Magnesian Limestone, with lenticular beds of marl.
(5) Coal Measures	Shales, with occasional sandstones.
(4) Millstone Grit	Thick beds of felspathic grit, with intervening shales.
(3) Yoredale Rocks... ...	Alternations of limestone, sandstone, and shale.

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* Map, p. 236. Continued from vol. xxi. p. 401.

(2) Carboniferous Limestone	Massive white limestone.
(1) Silurian and older rocks	Chiefly slates and hard grits.

"The Silurian rocks make a small outcrop on the high plateau about Malham Tarn, and are in part responsible for a change in the vegetation perceptible there. This will, however, be best considered in connection with a map to be produced later. The Carboniferous (or Mountain) Limestone is not clearly marked off from the Yoredale series, which is, indeed, a modification of the upper part of the Carboniferous Limestone produced by invasion of sedimentary materials from the northward. The sedimentary rocks (sandstones and shales) form a succession of wedges, whose thin ends are directed southwards. From Malham to Threshfield, in Wharfedale, the Mountain Limestone is abruptly cut off by a great dislocation, the Northern Craven fault, which can be distinguished for a long distance by the sharp contrast between the grassy pastures of the limestone and the dark heather or grass heath vegetation of the Millstone Grit. In the valleys of the Upper Wharfe and its tributaries, as well as in Upper Airedale, the limestones of divisions 2 and 3 (see table above) occupy a large area, and attain altitudes of about 1500 feet. From the main outcrop, tongues extend from Threshfield eastward to Keld Houses, near Pateley bridge, and from Skipton across to the Wharfe near Bolton Abbey.

"The Millstone Grit forms a cap on the hills above 1500 feet in the north-western part of the map, and extends as a continuous sheet over an area roughly defined by Bradley and Lamb Hill on the northern edge of the map, and Thorner towards the south-eastern corner on the southern edge. Small inliers of the Yoredales rise through this rock in Upper Nidderdale and at Harrogate. Three small patches of the Coal Measures appear on the southern margin at Yeadon, Baildon, and Laneshaw. The Millstone Grit declines to the eastward and disappears under the Magnesian Limestone of the Permian series, whose western boundary is indicated approximately by Mickley, Azerley, Fountains Abbey, Markington, Brearton, Bilton, Starbeck, Plompton, Spofforth, East Keswick, Bardsey, and Thorner. The eastern belt is occupied by Trias, but it is deeply covered by Drift and Alluvium, through which it emerges only in a few small patches near Ripon. The glacial deposits are extensively developed, especially in the valleys, and in places are so heavily charged with limestone *débris* as to produce a vegetation characteristic of limestone in a district composed of other rocks."

The area offers an excellent opportunity for contrasting the limestone vegetation with that of neighbouring sedimentary rocks. The task is made easier by what has already been done in or near this district by Mr. J. G. Baker (1885) * and Mr. F. A. Lees (1888). The introduction to "North Yorkshire" as a whole, and the chapter on lithology in particular, deal so thoroughly with the relation of vegetation to soil and climate, that reference should be made to the original itself. Both authors apply to Yorkshire Thurmann's recognition of eugeogenous and dysogeogenous rocks. The former class of rocks yield a plentiful detritus, and the overlying soils are cool and moist. The dysogeogenous rocks—or limestones of this area—yield a less abundant detritus, and are in Yorkshire much fissured and broken, so that the overlying soil is comparatively dry. A map, showing the distribution of the underlying rocks and their constitution, is included in 'The Flora of West Yorkshire.' The value of the work of these authors is supported by the evidence of the present survey, the scale of which allows of considerable detail in representing the distribution of the vegetation. The vegetation of the district and the geology, speaking generally, vary together. The limestones especially may be traced from the plants with considerable accuracy. The effect of surface deposits, whether peat, alluvium, or glacial *débris*, is to mask the true relation of rocks and overlying vegetation. In this district, the deposits are most conspicuous where they cause local displacement of the limestone vegetation by one more like that of the sandstone rocks.

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* The numbers in brackets after an author's name indicate the year in which a book or paper was published. The titles of the works referred to will be found in the

The water-supply is an important edaphic factor. A series of springs emerging from some rock-stratum rarely fails to alter the vegetation. The zone of grass heath round so many of the moors is due in part to the constant moisture and the increased food-supply brought by springs emerging on the slopes. The wet and dry associations of the grass heath and heather moor are also correlated with the water-supply. The conditions of drainage are no less important. Thus, slopes have a vegetation differing from that of a flat, or almost flat, plateau. A prime factor in determining the vegetation of the limestone is the rapid drainage and scanty reserve of water in a soil overlying a much-fissured rock.

(*b*) *Climatic Conditions.*—The variations in climate are considerable for so limited an area, and only the chief features can be indicated now. The following table gives the mean annual rainfall for places within the district. In order to facilitate reference to the map, the river-basin in which the station occurs is given. The number in brackets indicates the number of years of observation, and the rainfalls are given to the nearest inch. The thirty-year observations (1870 to 1899) were kindly supplied by Dr. H. R. Mill. The other records were estimated by us from 'British Rainfall,' generally only for the

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List of References at the end of this paper. The authors' names are arranged alphabetically, and the papers of each author in chronological order, with the year-number in brackets. In the case of a periodical, the number in brackets is the year of publication of the paper referred to.

ten years 1891 to 1900, and are therefore only correct for that period. The York record for fifty-four years is taken from a pamphlet issued by Messrs. H. Richardson & Co., York.

MEAN ANNUAL RAINFALL.

Station and number of annual observations.	Altitude.	Rainfall.	Zone of vegetation.
	Feet.	Inches.	
York (average of five gauges) (54)	50	24	Wheat cultivation.
South Milford (30)	70	26	
Ripon (Ure) (10)	120	27	
Knaresboro' (Nidd) (10)	200	27	
Leeds (Allerton Hall) (Aire) (30)	418	28	
Harewood (Wharfe) (10)	139	31	
Silsden Reservoir (Aire) (10)	560	31	Near upper limit of wheat.
Skipton (Aire) (10)	350	34	
Bolton Abbey (Wharfe) (6)	350	36	
Ilkley (Wharfe) (10)	600	37	
Blubberhouses (Washburn) (10)	575	38	Cultivation without wheat.
Pateley Bridge (Nidd) (10)	410	41	
Dallow Moor (Skell) (10)	859	36	Heather moor.
Barden Reservoir (Wharfe) (10)	746	43	
Grimwith Reservoir (Wharfe) (30)	890	46	Near eastern (or drier) edge of Moss moor.
Rainstang (Nidd) (10)	1470	47	
Masham Moor (Ure) (10)	1412	48	
Angram (Nidd) (10)	1150	55	Moss moor.
East Gill Head (Nidd) (9)	1710	55	
Malham Tarn (Aire) (10)	1296	58	Limestone pasture (western rainfall).
Arncliffe (Littondale) (Wharfe) (30)	734	61	

The mean annual rainfall is under 30 inches (75 cms.) east of a line drawn from Masham (Swinton) southwards to Ripley (on the Nidd), and then curving slightly westwards between Leeds and Bradford. A roughly parallel line at from 5 to 8 miles west denotes the beginning of rainfalls over 40 inches (100 cms.). In the valleys of the Lower Wharfe and Aire, the zone of rainfalls between 30 and 40 inches is deflected up the valleys for a considerable distance. The relation between the rainfall and the zones of vegetation will be dealt with as the latter come under consideration.

The records of temperature are scanty and not always reliable, hence it is as yet unsafe to make comparisons between this factor and the vegetation. The mean annual temperature of lowland stations in Yorkshire given by Dr. Buchan (1898) shows that they are at least 48° Fahr.; Leeds (137 feet) is about 49° Fahr., York and Wakefield are each about 48° Fahr. In regard to higher stations, there is approximately a decrease of 1° Fahr. for each 300 feet ascent. Thus Harrogate (344 feet) and Bradford (366 feet) are each about 47° Fahr., Aysgarth (658 feet) nearly 46° Fahr., and Hawes (1135 feet) 44° Fahr. The coldest month of the year for Yorkshire stations is January (35° to 38° Fahr.); the warmest month is July (57° to 61° Fahr.).

Other features of the climate of Yorkshire are described in the introductory chapters in the Floras of Mr. Baker (1885) and Mr. Lees (1888).

The general situation of the farmland, woodland, and moorland in the present area agrees with that shown in the map of the Leeds and Halifax district. The chief mass of farmland and woodland occupies the eastern lowlands and the dales; the moorland is almost all confined to the western highland. The distribution of the vegetation in this district varies largely with the nature of the underlying rocks. It is, therefore, advisable to consider the vegetation of the Mountain Limestone and Permian Limestone apart from that of the Millstone Grit and other sedimentary rocks. The moorland and woodland, as will be seen later, are closely related, and will be kept together. The general plan of the following pages is thus arranged:—

A. The Moorland and Woodland of the Sandstones and Shales.
B. The Moorland and Woodland of the Limestone rocks.
C. The Farmland.

A. VEGETATION OF THE SANDSTONES AND SHALES.

1. THE MOORLAND.—In contrast with the moors of the narrow Pennine plateau south of the Aire valley, the moors of the present district are broad and extensive. The country is wilder and more desolate, and, being remote from large centres of population, shows few indications of interference by man. The various forms of moorland vegetation are found on a grander scale, and, whilst showing new features, they serve to check opinions formed in the Leeds and Halifax district.

THE COTTON-GRASS MOSS OR MOOR.—Stretching from the north-west limits of the map beyond Buckden Pike, southwards for 18 miles to Rocking Moor, there is a broad area of cotton-grass moor, broken only by two narrow tongues of limestone pasture near Kettlewell and Dry Gill. The range of elevation is from 1250 feet (380 metres) to 2000 feet (606 metres). Over this extensive and high moorland, the dominance of the two cotton-grasses (*Eriophorum vaginatum* and *E. angustifolium*) is undoubted; and confirms the earlier recognition of these as the dominant plants of the higher Pennine plateau (see Figs. 1 and 4). Crowberry (*Empetrum*) and Bilberry (*Vaccinium Myrtillus*) are frequent, though variable in quantity from place to place. Other associates are such as already detailed in Part I., but in addition, in this less-frequented locality, more records of the rarer plants have been obtained, including *Rubus Chamæmorus*, *Drosera rotundifolia*, *Arctostaphylos Uva-ursi*, and *Lycopodium Selago*. An area such as this, covered almost entirely by cotton-grass, is dreary in the extreme. The peat is rarely less than 5 feet in depth. The rainfall is high and frequent. In the wet season, the moor is a soaking mass, with small pools between the tufts of cotton-grass, and soft dangerous peat-banks fringing the numerous watercourses (see Fig. 1, Part I.).

Near the margin of the moss the dominance of cotton-grass is frequently shared by Heather (*Calluna*) and Pink Heath (*Erica Tetralix*). This association, indicated by "EH" on the map, is well developed at the head of Nidderdale and Coverdale. The commoner associates are *Empetrum nigrum*, *Vaccinium Myrtillus*, *V. Vitis-Idæa*, and *Rubus Chamæmorus*. The situation is at the moor-edge, on the plateau just above the steeper slopes occupied by the heather moor. The substratum is peat, varying in depth from 5 to 8 feet, and nearly always wet and boggy. *Erica Tetralix* is most abundant where the bog is constantly wet. On the other hand, drier conditions favour *Calluna*. The zone, being found near the lower limits of the cotton-grass moss, may be regarded as transitional between this and the heather moor.

The Vegetation of Summits.—The Bilberry (*Vaccinium Myrtillus*) was found to be the dominant social form on the rocky wind-swept summits of the Pennines described in Part I. The peaks of several of the lower moorlands in the present district were also found to be occupied by the bilberry and a few associates adapted to withstand the drier and more exposed conditions of that situation. The best example is on Earl Seat, a peak of Barden Fell rising to 1474 feet. The corner of the fell rises abruptly from the valley as a dry rocky slope, scantily covered with *Vaccinium Myrtillus*, *V. Vitis-Idæa*, *Calluna*, and occasionally the bracken fern. The Vaccinium summit is more completely occupied by the bilberry, and in one direction changes gradually into cotton-grass moss.

On the summit of Great Whernside, the Vaccinium association is quite absent. This is a long narrow ridge with steep sides, set conspicuously on the general mass of moorland (see Fig. 4). It is surrounded by deep peat with cotton-grass vegetation, which rises to over 2000 feet on the eastern side, but not so high on the steeper western slopes. The summit-ridge from the edge of the peat-bog upwards is rocky, with a scanty soil which supports a meagre vegetation consisting chiefly of grasses. Here and there are patches or islands of peat. The peat is loose in texture and scantily covered with cotton-grass and crowberry, which as peat-binders are largely responsible for the maintenance of the islands. The few plants occurring on the peat islands belong to the cotton-grass moss, but the grassy or alpine pasture is quite distinct. The following plants were recorded:—

Alpine Pasture.	Peat Plants.
* *Nardus stricta*, L.	*Eriophorum angustifolium*, Roth.
Deschampsia flexuosa, Trin.	*E. vaginatum*, L.
Festuca ovina, L.	*Empetrum nigrum*, L.

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* The nomenclature of the London Catalogue, 9th edit., is followed throughout.

ALPINE PASTURE.

F. ovina (*f. vivipara*).
Agrostis vulgaris, With.
Anthoxanthum odoratum, L.
Poa alpina, L.
Juncus squarrosus, L.
Luzula erecta, Desv.
Carex flacca, Schreb.
Calluna Erica, DC. Dwarf.
Rumex Acetosa, L.
R. Acetosella, L.
Galium saxatile, L.
Potentilla silvestris, Neck.
Cerastium triviale, Link.
Lycopodium Selago, L.

PEAT PLANTS.

Vaccinium Myrtillus, L.
Calluna Erica, DC.
Rubus Chamæmorus, L.
Scirpus cæspitosus, L.

The occurrence of the alpine pasture is interesting as indicating a vegetation of a higher zone than the cotton-grass moss. The majority of the species occur in the grass heath of lower elevations, below the cotton-grass, and are absent in the intermediate peaty zone. In the case of Buckden Pike, a few miles further north, the summit is closely carpeted with *Juncus squarrosus* and cotton-grass with associates, including those found on Great Whernside. The type of summit represented by these two peaks is one recognized by Mr. Baker (1885). The association is that of most of the summits over 2000 feet, including Ingleboro, Penyghent, Whernside, and others visited by us to the north and west of this area, and will be further considered in a future paper.

HEATHER MOOR.—A comparison of the present map with that of Part I. will show at a glance the greater development of the heather moor (see Fig. 2). Altitudes above 1250 feet, which in the Halifax district are covered with cotton-grass and thick peat, are in the present area occupied by heather moor or shallower peat. Barden Moor shows this particularly well. This lack of agreement merits closer attention. It was suggested in the previous paper that the chief factors which determined the existence of the Eriophorum moss, as distinguished from the Calluna moor, are (1) a higher rainfall; (2) defective drainage favouring the accumulation of water and the development of thick peat; (3) less interference by man. The present district offers an opportunity for examining these conditions, and at the same time obtaining information on the œcological features of the heather moor.

Rainfall.—Reliable statistics for the moors are somewhat limited, but from those already given (see p. 152; also Part I.) it will be seen that the larger expanses of heather vegetation occur on that part of the moorland which has the lower annual rainfall, whereas the moss moor receives more rain. Dallow Moor and Barden Reservoir are stations on the heather moor, and they show 36 and 43 inches respectively. Other stations which are near heather moors are Ilkley, with 37 inches, and Blubberhouses, with 38 inches. Comparing these with stations on the moss moor, it will be seen that a lower rainfall prevails on the heather moor.

Drainage.—The better drainage of the heather moor is apparent; as a rule it occupies well-marked slopes, excavated in many parts by streams. The peat is shallow, varying from a few inches to 4 or 5 feet. Continuous tracts of deep wet peat are rare. At the base of the peat there is frequently a distinct "moor-pan," consisting of sand or grit massed with oxides of iron and humus into a hard, impervious stratum of dark-brown sandstone. Graebner has recently (1901) indicated the widespread occurrence of this pan in the heaths of North Germany, and the method of its formation. Our observations amply confirm his, though it is not uncommon to find the moor-pan replaced by a layer of yellowish-white clay of close texture.

Influence of Man.—The heather moors are chiefly preserved as grouse-shootings, and in a less degree as sheep-walks. The moors on which ling (*Calluna*) is most dominant are regularly burnt in patches of a few acres by the keepers, for the purpose of maintaining a vigorous growth of young heather. Where the heather is slow in recovering on a burnt patch, *Vaccinium Myrtillus* and *V. Vitis-Idæus* may temporarily secure dominance. Near the upper limits of the heather moor, as on Rocking Moor, man has obtained large tracts from the cotton-grass moors, and there fostered heather. The process seems to have been—grazing the cotton-grass heavily by sheep, burning, deep drainage, and clearing away peat.

The vegetation of the heather moor is uniform over considerable areas (Fig. 1). The ling is knee-deep when growing luxuriantly, and the close growth allows but few associates.

The following are typical species :—

DOMINANT.

Calluna Erica, D.C.

SUB-DOMINANT.

Vaccinium Myrtillus, L.
V. Vitis-idæus, L.
Erica Tetralix, L.
Juncus, spp.
Nardus stricta, L.
Deschampsia flexuosa, Trin.
Pteris aquilina, L.

COMMON ASSOCIATES.

Potentilla silvestris, Neck.
Galium saxatile, L.
Erica cinerea, L.
Rumex Acetosella, L.
Luzula erecta, Desv.
Scirpus cæspitosus, L.
Agrostis vulgaris, With.
Molinia varia, Schrank.
Lomaria Spicant, Desv.

The sub-dominant species are noteworthy, because under suitable conditions they become more or less dominant, and, competing with Calluna, they disturb the uniform tone of the heather moor. The conditions which favour each are somewhat different. The bilberry is present throughout every heather moor, but along the moor-edge escarpments, and on the drier summits, it increases so as to become a conspicuous dominant form. The cowberry (*Vaccinium Vitis-idæus*) accompanies the bilberry, attaining its maximum development on dry rocky ground. The bracken (*Pteris*) is often found growing luxuriantly, breast-high, on the steep slopes of a stream ravine. The rocky fell-sides are similarly frequently covered with this fern. Occasionally it grows so free from admixture with other plants, that areas, often acres in extent, are annually mown by freeholders of the townships for use as cattle-bedding. The moor mat-grass (*Nardus stricta*) may become so conspicuous that its intrusion is visible a long distance away. Occasionally, where little attention is paid to the heather by the keepers, the mat-grass seems to be struggling successfully with it and to choke it out.

The taller rushes (*Juncus*) form close associations or Junceta, and are a prominent feature of a heather moor. The habitat is the marshy hollows or flats, the first gathering grounds of the moor streams. Many of the larger Juncus marshes are indicated on the Ordnance Survey maps, though too small for representation on our map. Good examples occur near the Woolstones on Denton Moor, and on Dallow Moor. Small examples are to be found where springs emerge. The dwarf shrubby vegetation of the drier heather moor is so little present in these Junceta that they are mown by scythe or sickle. The close growth of the tall rushes is exclusive of other plants, but on the ground beneath and around the margins the following occur :—

Juncus effusus, L.
J. conglomeratus, L.
J. supinus, Moench.
J. lampocarpus, Ehrh.
J. acutiflorus, Ehrh.

Ranunculus Lenormandi, F. Schultz.
R. Flammula, L.
Stellaria uliginosa, Murr.
Montia fontana, L.
Potentilla palustris, Scop.
Drosera rotundifolia, L.
Hydrocotyle vulgaris, L.
Galium palustre, L.
Cnicus palustris, Willd.
Schollera Oxycoccus, Roth.

Andromeda Polifolia, L.
Erica Tetralix, L.
Veronica scutellata, L. (uncommon).
Pedicularis palustris, L.
Pinguicula vulgaris, L.
Narthecium Ossifragum, Huds.
Juncus squarrosus. L.
Potamogeton polygonifolius, Pour.
Scirpus cæspitosus, L.
Carex pulicaris, L.
C. curta, Good.
C. echinata, Muss.
C. Goodenowii, J. Gay.
Molinia varia, Schrank.
Nardus stricta, L.
Sphagnum, spp.

Around pools of standing water on the moor, the dominant forms are frequently *Juncus squarrosus* and *Erica Tetralix*, while the taller rushes are much less conspicuous. Such places are also favourable to many of the above plants.

Cotton-grass also occurs locally on wet parts of the heather moor. In some cases the cotton-grass bog may lie at a lower level than the heather moor, and thus apparently contradict the view previously expressed, that the cotton-grass moss occupies the upper zone of a moorland, and heather the lower. Where the moss is developed at a lower level, it is in some badly drained trough. Cases occur on Rumbolds Moor and Barden Moor.

GRASS HEATH (H Pa).—The grass vegetation in which there is an admixture of the heather moor associates is distinguished on the maps from the natural pasture, or grass without the heath plants (Pa). The former, or grass heath, occurs on poor soils; the latter is very characteristic of the limestone, and is regarded as part of that vegetation. The grass heath generally replaces the heather at the moor-edge, and forms a fringe round the moorland (Fig. 2). It may occur as a close turf of grasses and other plants, on the steep, well-drained slopes, where peat is not formed, and the soil conditions favour a vegetation adapted to a dry situation. On the other hand, the presence of certain grasses may indicate a place kept constantly moist. The constitution of these two extremes of the grass heath has already been given in detail in Part I. The dry grass heath is dominated by the grasses—*Deschampsia flexuosa*, *Festuca ovina*, and *Nardus stricta*, with their associates. The wet grass heath has frequently *Molinia varia* as the dominant grass, with sedges, rushes, and other moisture-loving moorland plants as associates. The presence of a grass heath is thus determined in some measure by natural causes, but enclosure and grazing are responsible for its existence in many places. The extensive tract of grass heath east of the Washburn valley is worth a detailed consideration. Almost all this area has at some time been enclosed as farmland or grazing-ground. Before enclosure it was probably a heather moor with a broad margin of grass heath. The map shows it at the present day with many fields and farms abandoned and reverting to moorland. The soil is poor, the farms small and not very productive, but the abandonment has been hastened because much of the area has been thrown out of cultivation as a result of purchase by the corporation of Leeds as a gathering-ground for a water-supply. Ling and gorse (*Ulex*) are typical of the vegetation which intrudes on the fields left uncultivated or ungrazed. After a few years, some fields are invaded by patches of ling, bilberry, rushes, and other plants of the heather moor. In other fields gorse becomes established along with birch and hawthorn. Where the soil is naturally peaty, Calluna with its associates takes possession at once. Gorse is the intruder when the grass vegetation remains, or when Calluna comes slowly. It was noted in several places that after the gorse had grown tall and thin, Calluna had become established beneath it. A later stage is presented by places where the heather vegetation occupies the moor, except on the knolls and rocky edges where gorse still holds on.

2. WOODLAND OF THE SANDSTONES AND SHALES.—Wherever the soil is formed of weathered sandstones or shales, the woods are those in which oak is the most common deciduous tree, and Scots pine the most frequent of the conifers. In contrast, the woods of the scars and valleys of the Mountain Limestone are characterized by ash and hazel, while

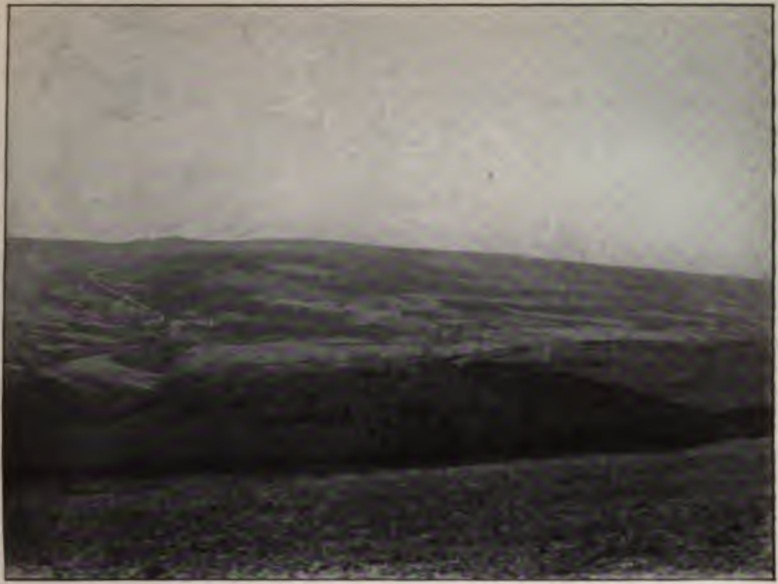

*FIG. 1. From Bolton Park, looking towards crags of Simon Seat. Pine-wood, and meadow-land at Agill House (800 to 900 feet), intaken from surrounding heather moor. The heather extends upwards to 1,250 feet; the light patches are portions which have been burnt. Cotton-grass moss on the sky-line, above 1,250 feet.

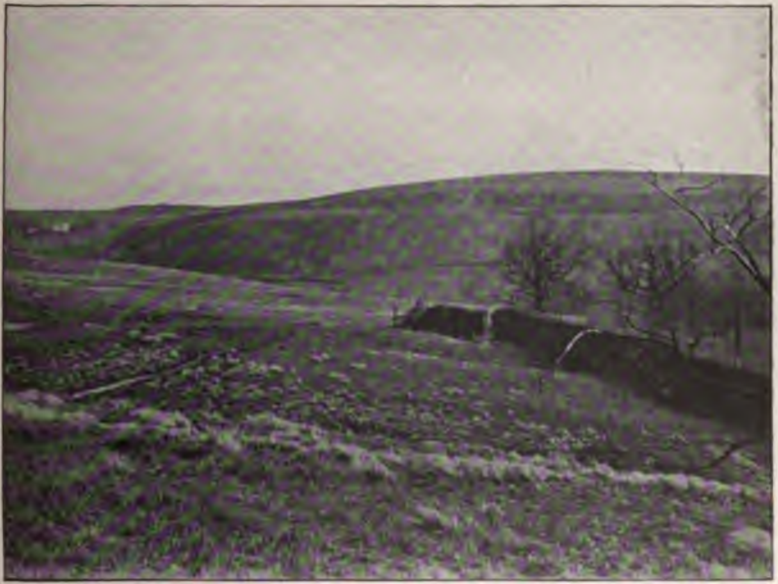

FIG. 2. From Bolton Park looking south-east. Corner of upland oak wood (about 800 feet). The moorland is grass heath, which on the further slopes is strongly mixed with heather. The farm is named "Intake" on the map.

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* The Photographs reproduced (*except Fig. 3*) were generously placed at our disposal by Miss BROWNSWORTH, *Photographer, Skipton*. Figures 1 and 2 were specially taken for this paper.

the Permian may also claim the beech as a dominant element. On the lowland and in the sandstone parts of the dales of this district, the succession of oak woods agrees generally with that already described in the area south of this (Part I.). Pine woods are, however, more numerous and merit notice.

The following woods are recognized on the Sandstone area:

(1) Gill woods.
(2) Upland oak woods.
(3) Lowland oak woods.
(4) Pine woods.

These types of woodland may be conveniently observed near each other in the extensive woods in Wharfedale near Bolton Abbey. About the Abbey itself, the Wharfe has eroded the sandstones and shales of the Yoredale series, forming a valley with alluvial terraces in the bottom. These are occupied by mixed deciduous trees, including beech and other lowland species, many doubtless planted round this old abbey. The ground vegetation is varied, and includes many plants which prefer shade and moisture. It is a lowland oak wood, modified by the presence of introduced trees. Within the range of the river-floods, it is not unusual to find plants of the Mountain Limestone vegetation washed down from Upper Wharfedale; amongst these may be noted *Geranium lucidum*, *Saxifraga tridactylites*, *Cochlearia alpina*, *Primula farinosa*, *Melica nutans*, and *Sesleria cœrulea*. The valley higher up the river is a narrow gorge cut through the Millstone Grits. On the steep rocky banks about the Strid, the oak becomes more abundant, the ground is less shaded, and moorland plants like bilberry, bracken, and even heather, take the place of shade plants. Leaving the river, and passing upwards on the left bank, the same characteristic vegetation—that of the upland oak wood of Yorkshire—will be found to prevail throughout the upper parts of the wood and the tributary valleys. Still higher up these tributaries, near the moor edge, the gill wood is found as a scattered copse of birch and thorn. Plantations of Scots pine and larch, with other conifers, have replaced the gill wood in places, and have been carried on to the moor round the slopes of Simon Seat and Earl Seat, beyond an altitude of 1000 feet (see Fig. 1).

Gill Wood.—The steep descent from the moor plateau, known as a clough in the district described in our former paper, is in this area called a "gill." Many of the gills, especially those of Upper Wharfedale, are eroded from the Mountain Limestone; their vegetation will be dealt with later. Gills excavated from sandstones or shales occur in the course of streams flowing into Wharfedale, from Burnsall down to Otley, and on the tributaries of the Nidd. The dominant plants form a loose scrub consisting of birch, mountain ash, holly, hawthorn, blackthorn, and willows. The undergrowth is, in part, intruding plants from the moor, such as ling and other heaths, bilberry, bracken, and the moor grasses. The vegetation of the clough, given in detail in Part I., may be found where the conditions are similar, that is, when the stream descends abruptly from the moor. But, as already indicated, much of the moorland is of the drier heather type, and in gills there, the undergrowth is limited, lacking especially those plants which require moisture; the trees are widely scattered, and the undergrowth is that of the open banks of a moorland stream.

The gill wood of this district is interesting, because there is evidence that its distribution at the present time falls far short of what it was formerly. A series of observations in "Studies of Nidderdale" (J. Lucas, 1881) has been particularly useful in completing our notes. The author concludes that the moors of Nidderdale were formerly covered by an ancient forest, which consisted chiefly of birch. He recognizes an upland oak forest, the upper limits of which are about 1200 feet, and above this a birch forest. This evidence is valuable because it indicates the presence in Yorkshire of the sub-alpine birch forest, recognized as the uppermost zone of woodland in the valleys of the Grampians in Perthshire and Forfarshire (R. Smith, 1900). That the clough wood was a modification of the Scottish birch wood, was suggested in Part I., but sufficient evidence was not available to confirm it. Mr. Lucas gives Birk Gill (600 to 900 feet), on a tributary of the Burn (just beyond the northern boundary of our map), as the most typical existing example of the birch wood in this district. Other examples, mentioned by this author, were noted by us before seeing his book. Arna Gill (800 to 1000 feet), on a stream from Ilton Moor into the Pott Beck, shows a birch wood of the gill type, which includes one or two oaks, ash, thorn, and bird cherry. A copse of birch, alder, and willow is to be found near Pry House on the right bank of the Upper Nidd, at an altitude of 1100 to 1200 feet. The existence of the birch wood at higher altitudes is shown chiefly by the occurrence of buried trees in the peat. The details given by Mr. Lucas are here briefly summarized:—

(*a*) Moors east of Great Whernside, *i.e.* Black, Riggs, and Stone Moors. Birch thicket up to 1250 feet. In the peat, birch stems up to 1725 feet, oak stems 1000 to 1050 feet, and hazel nuts at 1650 feet.

(*b*) Woogill or North Moor, north of the Nidd. Thicket with birch up to 1275 feet; isolated mountain ash at 1550 feet; and hazel 1350 feet. In the gills of Steel House Moor, north of Woogill (and beyond the map): thicket in Birk Gill up to 900 feet; isolated trees of birch and mountain ash to 1175 feet, and thorn to 1100 feet; in the peat, birch stems at 1600 feet.

(*c*) Fountains Earth and Dallow Gill Moors. Thicket with birch, thorn, and mountain ash (also isolated trees of these), with holly, alder, and oak, from 800 to 1100 feet; in the peat, birch stems up to 1525 feet. Juniper occurs at 925 feet in one place.

These facts so far confirm the suggestion of Mr. Lucas, that a continuous thicket of birch and its associates covered the present moorland edge, and attained an altitude much beyond the upper limits of any of the existing woods.

Upland Oak Wood.—This zone, already recognized in Part I., is well represented in the sandstone valleys of this area, but is absent in the numerous valleys on the Mountain Limestone. The lower limits of the upland zone is about 500 feet (152 metres). The upper limit occurs when the oak ceases to be a dominant tree—that is, from 800 to 900 feet (see Fig. 2). Isolated living oaks are recorded by Mr. Lucas up to 1100 feet, and dead stems occur in the peat up to 1250 feet. The upland zone of oak is best represented in the gently sloping valleys of the Skell, Laver, and other streams draining the eastern side of the heather moor. It is less extensive in the short, steep, lateral valleys of the Wharfe and Nidd. The dry, upland, rocky wood is favourable for the growth of Scots pine and other conifers; and in this area, where many of the woods are systematically tended, there is a considerable admixture of these trees in the oak wood, and this is shown on the map. In many cases the original woods have been completely replaced by pine wood. The effect of the conifers is to alter the characteristic vegetation of the upland oak wood, and in an extreme case the ground may be almost bare. The plants of the upland oak wood are given in detail in Part I., and need not be repeated here. The subdominant species are generally birch, wych elm, holly, hazel, mountain ash, blackthorn, and hawthorn. Sycamore may be introduced from seeds, or planted; beech is also sometimes planted. The chief distinction between the upland oak wood and the birch thicket is the dominance of oak, and the more varied ground vegetation resulting from moister and more sheltered conditions.

Lowland Oak Wood.—Woods of this type occur below an altitude of about 500 feet. In the district already described (Part I.), the oak wood formed a broad zone on the lowlands of the Coal Measures. In this district, however, the lowland oak wood is almost confined to the broad valleys of the larger rivers before these enter the Permian tract. In Wharfedale they extend from Harewood upwards to Burnsall, where they cease on the Mountain Limestone. In Nidderdale, the woods in the valley bottom round Pateley Bridge and down the valley to Ripley are also of this type. The oak (*Quercus Robur*, vars. *pedunculata* and *sessiliflora*) is distinctly the prevailing tree. Sycamore (*Acer Pseudo-platanus*) and wych elm (*Ulmus montana*) frequently share dominance. Beech grows well where planted, and if abundant has a marked effect on the dependent vegetation. It is, however, considered as an introduction into the oak wood, although where beech or other lowland trees are strongly represented in a wood, it is indicated as mixed deciduous. Alder and willows are abundant along the streams. Ash is not uncommon. Poplars and horse-chestnut (*Æsculus*) are more abundant than sweet-chestnut (*Castanea*) and lime (*Tilia*). Conifers have been planted amongst the deciduous trees in many woods, but pure pine woods are less frequent than in the upland oak zone.

The distinction between the vegetation of the upland and the lowland oak wood was shown by lists of associates in Part I. The outstanding features are summarized thus: The upland oak wood is usually dry and rocky, and deficient in humus; the lowland oak wood is damp, shaly, and richer in humus. The shade cast by the trees is much greater in the latter than in the former. Hence the flora of the latter is much richer in species, especially of the bulbous and early flowering kinds: the flora of the upland oak wood contains a high proportion of late-flowering, moorland xerophytes, which are practically absent from the lowland oak wood. This difference is also observable in regard to mosses and liverworts.

Trias Oak Wood.—On the Permian tract the woods lose the distinctive features of the lowland oak wood, and are dealt with as part of the limestone vegetation. East of the narrow Permian tract, the oak again becomes a conspicuous tree in the woods. The underlying rocks belong to the Trias formation, but the soil is generally derived from the glacial and alluvial deposits, which are here so prevalent. Woods of oak and mixed Scots pine are a characteristic feature, and, with plantations of conifers, form the coverts of this well-known hunting area. The Trias extends eastwards of the present map, and, until the remainder has been surveyed, it is advisable to defer consideration of it.

PINE WOODS.—In contrast with the Leeds and Halifax district, the present area shows numerous woods of Scots pine and other coniferous trees from Wharfedale northwards. These woods begin near the moor edge, sometimes on the heather moor itself (see Fig. 1), and may be frequently met with as pure plantations. On the limestone the conifers are not much in evidence, and a well-grown plantation in that area generally indicates glacial or alluvial *débris*. On the Trias, conifers again become a conspicuous element in the woods.

The Scots pine (*Pinus sylvestris*), the only native species, is the one most frequently seen, but larch is often planted in mixture with it. Spruce is not uncommon. Other species occur occasionally in the plantations, but as a rule they are confined to the parklands. The pine wood is best represented in the following habitats:—

(*a*) The heather moor with a well-drained peaty soil; never on the cotton-grass moss.

(*b*) Dry rocky places, such as occur on the moor edge escarpments, or along the rocky banks of a stream ravine.

(*c*) Sandy plains where some peat accumulates; this is the habitat of the Trias pine woods.

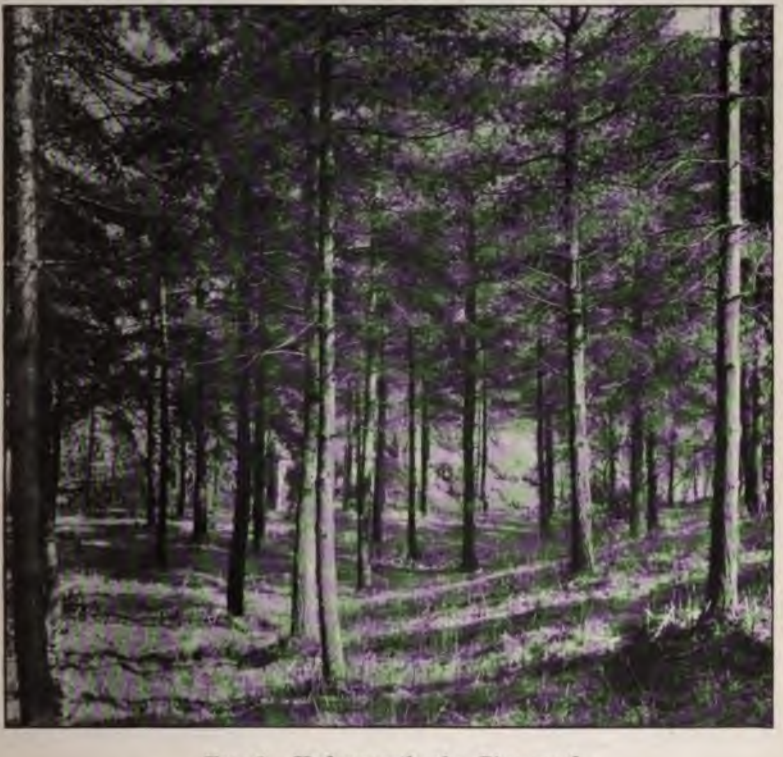

FIG. 3. Undergrowth of a Pine wood.
From photograph by Mr. W. B. Crump, M.A. (Halifax).

These habitats are almost similar to those given by Robert Smith in the Tay basin (1898), and he also mentions similar ones in Norway. Prof. E. Warming in Denmark, and M. Christ in Switzerland, also recognize these as habitats of Scots pine in their respective parts of Europe.

The relationship between the distribution of pine woods and that of heather moor is now generally admitted. In the present district the largest pine woods are found near the edge of the chief heather moors. Mr. Baker mentions that Hutton Moor, near Ripon, was formerly a tract of sandy heather land; it is now almost entirely cultivated, but it is interesting to note that the numerous small plantations are almost exclusively conifers. This also obtains on heather moors east of York, *e.g.* Strensall Common; and also at Pilmoor (just beyond the north-east corner of the map).

The occurrence of pine woods on or near the present heather moors suggests that they may represent a zone of natural forest at an altitude above the upland oak wood. In Scotland this is proved not only by the occurrence of living Scots pine at altitudes up to 2000 feet and over in Perthshire and Aberdeenshire, but also by the presence of pine stems in peat up to the same altitude. There is also much evidence that heather moor in the North German Plain (Graebner, 1901), and in Scotland, represents at the present day what has formerly been pine forest. In regard to Yorkshire, we give the opinion of authors dealing with the district. Mr. Baker (1885, p. 373), in referring to Scots pine, says, "This is a tree of the post-glacial peat-swamps. Whether any of the trees now in existence are the descendants of the aboriginal possessors of the soil may be doubted, and it is quite impossible to decide confidently." Mr. Lees (1888) doubts whether this tree is native anywhere in the West Riding, except in Thorne Waste, a lowland moor (about 20 feet), near Goole. Mr. Lucas (1881) does not refer to Scots pine at all, and he never recognized it in the peat of Nidderdale. Thus, although the Scots pine appears to be in favourable conditions on the heather moors at the present time, there is no evidence that it is indigenous or ever formed a primitive forest within the area of either of our maps. In connection with afforestation of moorlands, it is generally admitted that heather moor may be planted with Scots pine, larch, and other conifers, and it is the opinion of the foresters in charge of the pine woods on the Bolton Abbey and the Masham estates that the heather moors adjacent to the existing plantations could, after some little preparation, be planted with conifers (see Fig. 1). The highest existing woods in this district are those on Earl Seat and Barden Moor, where they rise to 1350 feet, while one small plantation in Upper Nidderdale is somewhat above this altitude.

The vegetation of the pine wood is scanty, and consists of plants from the heather moor and grass heath. Where the canopy is close, the ground is deeply shaded and covered with fallen needles, which decay slowly, forming a humus which readily dries up. The vegetation in such cases consists almost entirely of patches of mosses (*Polytrichum juniperinum* and *Dicranum scoparium* being common). Near the less-shaded margins of the wood, bracken fern is abundant, along with the plants of the grass heath. The moor origin of the pine woods above Bolton Abbey is easily traced from the ground vegetation. Heather occurs where the ground is peaty, remaining even in the deep shade beneath closely planted young trees. In open dry places and along the rides, a loose sward is formed by grasses from the grass heath, including *Deschampsia flexuosa*, *Agrostis*, *Holcus*, and *Festuca*. Where the drainage is deficient, plants of the wet grass heath or small Juncus swamps occur. Self-sown pines occur in the clearings and on the moor near the woods, but they are not so numerous as self-sown birch or mountain ash.

The vegetation of the pine wood may be regarded generally as that of the neighbouring moorland associations. The species characteristic of old pine woods in Scotland are either rare or absent in this area. *Trientalis europæa*, *Pyrola minor*, *P. media*, and *Listera cordata* are found occasionally on Sawley, Dallowgill, and other moors between the Wharfe and Ure. *Linnæa borealis*, *Corallorhiza innata*, and *Goodyera repens*, the latter especially typical of Scottish pine woods as far south of the Tweed, seem to be entirely absent from this district. These facts appear to support the view that the pine woods are not natural along the edge of the heather moor, but have been established by man.

B. Vegetation of the Limestone Rocks.

The distinctive vegetation of the two widely separated areas of limestone, the Mountain Limestone of Craven, and the narrow lowland tract of Permian Limestone abutting on the plain of York, has added much to the interest of this district. The sharp contrast with the vegetation of the neighbouring non-limestone formations is quickly noticeable even where the limestone outcrop is small and local. The higher altitude and greater rainfall of the Mountain Limestone area produces conditions very different from the lowland and drier Permian tract. The two areas may therefore be discussed separately, although it may be observed here that they have some features of the vegetation in common.

The Mountain Limestone.—The main mass of limestone developed in the north-west of this map is continued northwards into Wensleydale and westward into Ribblesdale and Lonsdale. The chief œcological features of the limestone vegetation may be observed within the limits of this map. Our conclusions, however, are based, not on the survey of this part only, but on what has also been found in neighbouring parts. Upper Wharfedale and Airedale give the best examples of the limestone vegetation. In Nidderdale the limestone comes to the surface only in a

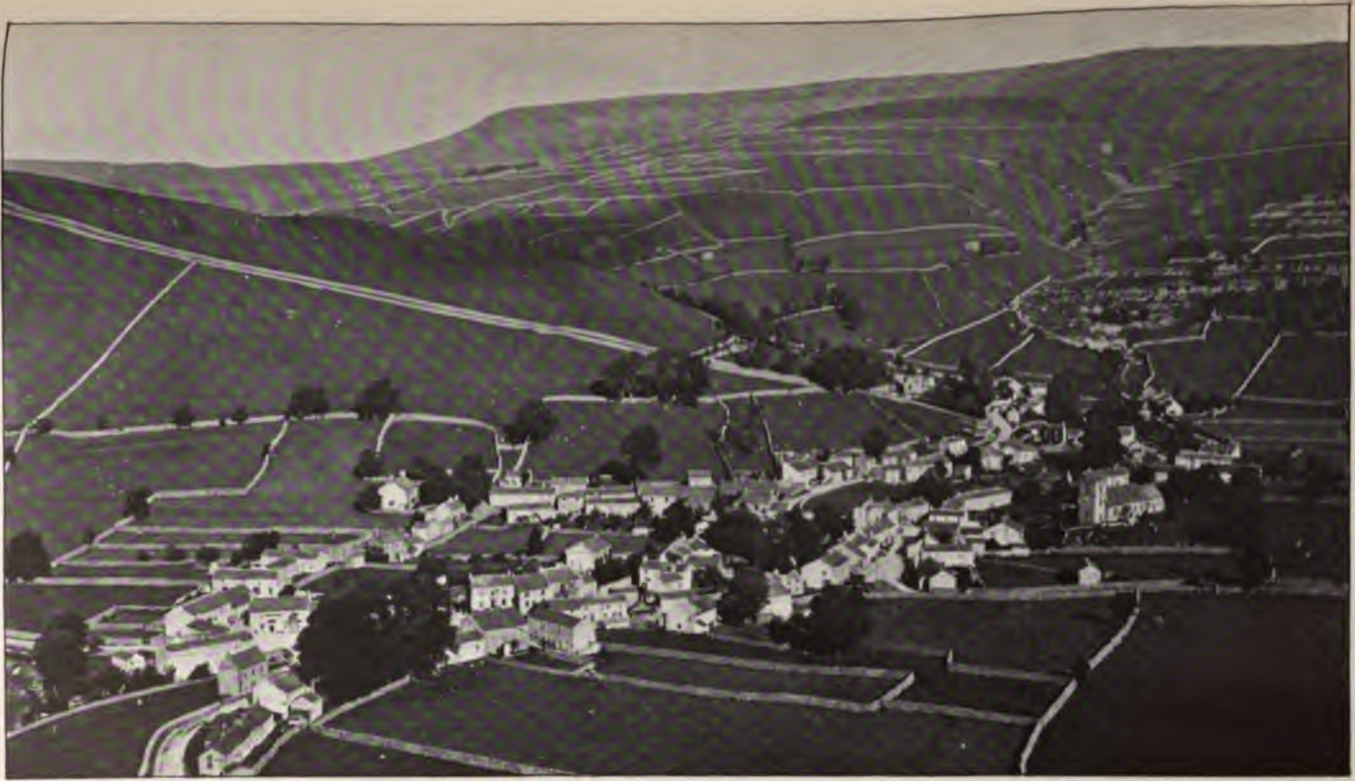

FIG. 4. Great Whernside with Kettlewell. Meadows near the Wharfe in foreground. The natural pasture on limestone extends as far up as the white walls (about 1,500 feet). The dark area above is heather. The upper slopes are cotton-grass moss, and the summit (2,310 feet) is Alpine pasture. (The photograph was taken across the valley, from about 800 feet altitude.)

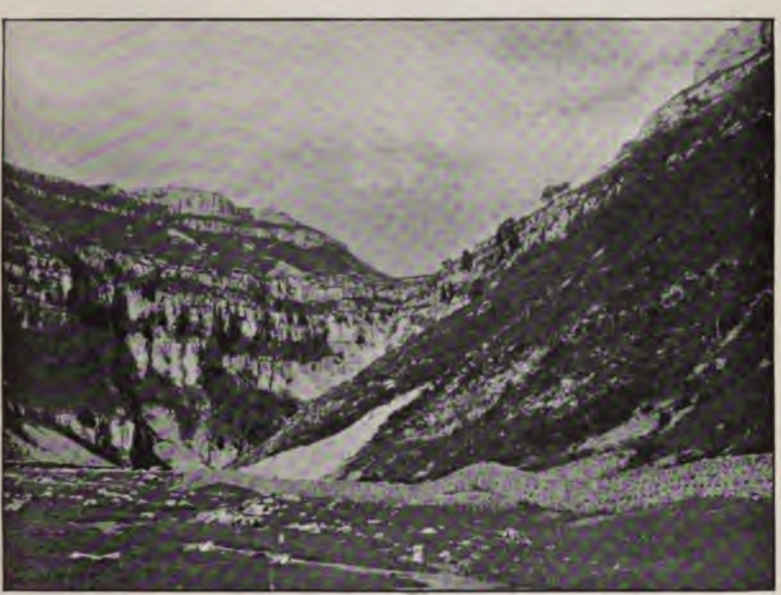

FIG. 5. Gordale Scar; height nearly 300 feet. The long scree on the right with a thin copse of hazel and birch. On the left, vertical scars with debris and copse vegetation on the ledges; the dark shrubs are yew.

few localities. The range of elevation on Malham Moor (High Mark) is from about 500 feet (150 metres) in the valleys, to 1750 feet (530 metres) on the moor-top; but in Upper Wharfedale, the upper limit may be taken on the average at about 1500 feet (456 metres).

The valleys are narrow, and the farm-land extends along the river as a narrow tract of grazing meadows (see Fig. 4). A few fields distant from the river, steep scars rise sharply up. In places these scars, with the trailing screes at the base,· are almost bare, but commonly they are covered with a loose copse, which shelters a grassy vegetation. Above the first line of scars there are pastures, often flat, sometimes steep and rocky, which again give place to higher scars; and so pasture and scar alternate, until the plateau is reached. Deep and rugged gorges have been cut in the hill-sides by torrents. In summer these are dry, or small streams run in them; in a few cases the volume of water is large and constant. Like the scars of the main valley, these gorges are often fringed with a loose copse. The view from some favourable hilltop down into the valley would take in the main features of the vegetation (Fig. 4): precipitous white scars and narrow ravines, white stone walls often running straight for miles, light green pastures, rich in the valleys, but thin in the pastures and slopes of the uplands. Trees are represented by scattered woods in the bottoms, and thin copses fringing the scars. The contrast between this vegetation and the dark green or brown heathery slopes of the Millstone Grit hills can be seen plainly miles away.

Hill Pastures.—Where the Millstone Grit caps the summits of the high ridges, cotton-grass and heather prevail, while the limestone hill pasture occupies the slopes below (see Fig. 4). On the extensive plateau of High Mark (Malham Moor), the limestone rises to the summit (1765 feet). So permeable is the limestone that, except where deposits of boulder clay occur, the moor is dry, although the annual rainfall approaches 60 inches (150 cms.). The few streams that arise either sink into underground channels which come to light again often many miles away, or cut for themselves deep narrow gills. An example of the former case is the stream from Malham Tarn, which, as soon as it leaves the Silurian slates, sinks into the limestone to reappear nearly 3 miles away. An example of the latter is Gordale (Fig. 5). The monotony of the wide expanse of pasture is relieved only by the bare white scars and pavements and the long lines of limestone walls. The moor is practically treeless. On the edge of the scars, a few struggling mountain ashes, thorns, and yews have established themselves in the clefts of the weathered rocks. Small groups of sycamore and ash indicate some upland farm, or a sheltered position on the lee side of some hill. For many years Mr. W. Morrison has endeavoured to afforest the grounds round his residence at Malham Tarn (1300 feet, and off the map almost west from Middle House on the western edge). A million trees have been planted, and of these scarcely fifty thousand survive. The owner's experience is that the locality is unsuited for larch and Scots pine, and that sycamore, beech, birch, alder, thorn, wych elm, and mountain ash grow, but exceedingly slowly.

Craven has from time immemorial been famous for its sheep-walks. Though the soil above limestone is somewhat thin, the short, crisp grass forms good pasturage, consisting chiefly of sheep's fescue (*Festuca ovina*). In early summer the yellow mountain pansy and wild thyme are present in profusion. The following plants occur generally on the dry hill pasture of the limestone:—

LIMESTONE HILL PASTURES.

Ranunculus bulbosus, L.
Thlaspi occitanum (Jord.).
Viola lutea, Huds.
Polygala vulgaris, L.
Arenaria verna, L.
Linum catharticum, L.
Geranium sylvaticum, L.
Anthyllis Vulneraria, L.
Lotus corniculatus, L.
Poterium Sanguisorba, L.
P. officinale, Hook.
Saxifraga granulata, L.
S. hypnoides, L.
Galium verum, L.
Scabiosa Columbaria, L.
Antennaria dioica, R. Br.
Carlina vulgaris, L.
Carduus nutans, L.
Cnicus eriophorus, Roth.
Primula veris, L.
Gentiana Amarella, L.
Thymus Serpyllum, Fr.
Stachys Betonica, Benth.
Plantago media, L.
Rumex Acetosella, L.
Habenaria conopsæ, Benth.
H. albida, R. Br. Rare.
H. viridis, R. Br.
H. bifolia, R. Br. Rare.
H. chloroleuca, Ridley.
Luzula campestris, DC.
Anthoxanthum ordoratum, L.
Avena pubescens, Huds.
A. pratensis, L.
Sesleria cœrulea, Ard.
Cynosurus cristatus, L.
Kœleria cristata, Pers.
Briza media, L.
Festuca ovina, L.
Ophioglossum vulgatum, L.
Botrychium Lunaria, Sw.

In moist places where springs arise, or by the sides of streams, the following may be found:—

Trollius europæus, L.
Cochlearia alpina, Wats.
Parnassia palustris, L.
Valeriana dioica, L.
Primula farinosa, L.
Pedicularis palustris, L.
Orchis latifolia, L.
O. maculata, L.
Juncus compressus, Jacq. Rare.
Scirpus Caricis, Retz.
Carex dioica, L.
C. flava, L.
C. hirta, L.
Glyceria fluitans, R. Br.
Selaginella selaginoides, Gray. Uncommon.

On this same moor-plateau there are numerous troughs in which boulder clay has lodged, and here the vegetation assumes more or less the character of a heath. On the summit of High Mark, the cap of Millstone Grit, so frequent on neighbouring summits, is absent, and any glacial *débris* which may have been present is reduced to patches. The bilberry (*Vaccinium Myrtillus*) and the heath-moss (*Polytrichum*) may be found along with plants of the limestone pasture. On the shoulder overlooking Cowside Beck, within a single square yard may be found *Sesleria cærulea*, *Festuca ovina*, *Viola lutea*, *Thymus Serpyllum*, *Vaccinium Myrtillus*, *Calluna Erica*, *Nardus stricta* and *Polytrichum*; representatives of the limestone hill pasture and the heath growing in mixture. This place is over a mile distant from the nearest heather moor, from which it is separated by a deep limestone gill. Again, on the steep slopes from Hawkswick Moor into Littondale there are, below the scars of limestone and covering the screes, large tracts of heather co-extensive with those on the grit cap above. The ling has been found here and elsewhere growing from clefts in limestone sink-holes, with its roots frequently closely pressed against the rock itself. On the flat spurs of Ingleboro, a little west of the present area, large tracts of limestone pavement bear a heather vegetation, which includes many plants of the heather moor. In face of these facts, it cannot be overlooked that heather may, under certain conditions, establish itself on limestone, but a fuller discussion is reserved for a future paper.

Limestone Pavements.—The pavements or flat summits of exposed limestone, bare of soil and weathered into a maze of narrow and deep clefts, form a striking feature of the Mountain Limestone. They occur generally on the exposed summit of a limestone scar, but others, isolated in the midst of hill pasture, are the remains of some weathered rocky ridge. At first sight apparently barren, except for an occasional dwarfed shrub emerging from a cleft, the pavements on closer examination reveal an interesting flora. The conditions of plant-life in the pavement clefts are very distinct from the adjoining hill pasture. There is shelter from the rigours of wind and sun, excessive evaporation during the heat of summer is checked, moisture is retained by a soil of considerable depth lodged in the numerous crannies, and throughout the year the shade is such as to favour shade-loving plants. Many of the plants found are those of the valley woods. In passing upwards from the moist valley woods, the plants abundant there are either absent or rare in the open pastures and the loose open scar woods, but reappear in the pavements above the scars, at an altitude seldom lower than 1000 feet (300 metres). The commonest plants are wood sorrel, wood garlic, anemone, hart's-tongue fern, and the green spleenwort. The following is a more complete list:—

Thalictrum calcareum (Jord.).
Anemone nemorosa, L.
Actæa spicata, L.
Viola Riviniana, Reich.
Geranium Robertianum, L.
Oxalis Acetosella, L.
Rubus Idæus, L.
Cratægus Oxyacantha, L. Dwarf.
Ribes petræum (Sm.). Rare.
Circæa lutetiana, L.
Heracleum Spondylium, L. Dwarf.
Hedera Helix, L.
Lactuca Muralis, Fr.
Corylus Avellana, L. Dwarf.
Listera ovata, R. Br.
Allium ursinum, L.
Asplenium viride, Huds.
A. Trichomanes, L.
Scolopendrium vulgare, Symons.
Polystichum lobatum, Presl.
Lastræa rigida, Presl.

The Limestone Scars.—The scars are either walled off from the adjoining hill pasture, or they are in themselves so precipitous that even goats seldom invade them. An opportunity is therefore given for the development of a natural vegetation, quite distinct from that of the grazing grounds. The precipitous scar-face, however, offers conditions very different from the scree of weathered *débris* at its base. At Malham, Gordale (Fig. 5), and Kilnsey, the scar-faces are almost vertical for nearly 300 feet, yet the numerous joints and crevices of the weathered limestone shelter a varied flora, consisting chiefly of compact dwarf plants, with at the most a few stunted trees. The screes are more favourable to vegetation, and where, as is often the case, the scars consist of a series of broad ledges littered with *débris*, the vegetation assumes the form of a shrubby thicket, with hazel and other shrubs dominant. The vegetation of the scar itself must, therefore, be distinguished from the scar wood.

Vegetation of the Scars.—In clefts of the rock and on occasional ledges on the scar, a scanty soil is formed. Such plants as can establish themselves are exposed to the direct rays of the sun, and those reflected from the rock. The amount of water available is scanty. In the deep narrow valleys the winds go up and down the trough. The scars do not, therefore, receive the full blast in front, and plants in the crevices, sheltered by the inequalities of the rock face, do not experience that rush of wind felt on the meadows below, or the upland pastures of the hilltop. The trees on the scars are few and stunted, such as hazel, yew, hawthorn, and mountain ash. The following plants are found here and there amongst the scars:—

Thalictrum calcareum (Jord.).
Arabis hirsuta, Scop.
Draba muralis, L.
D. incana, L.
Erophila vulgaris, DC.
Thlaspi occitanum (Jord.).
Hutchinsia petræa, R. Br. Local.
Helianthemum Chamæcistus, Mill.
Arenaria verna, L.
Geranium sanguineum, L.
G. lucidum, L.
Hippocrepis comosa, L.
Spiræa Filipendula, L. Rare.
Dryas octopetala, L. Local.
Potentilla rubens, Vill. Rare.
Cratægus Oxyacantha, L.
Pyrus Aucuparia, Ehrh.
Saxifraga tridactylites, L.
Ribes petræum (Sm.). Rare.
Sedum Telephium, L.
Galium sylvestre, Poll.
Hieracium Pilosella, L.
H. anglicum, Fr. Rare.
H. cæsium, Fr.
Lactuca muralis, Fresen.
Corylus Avellana, L.
Taxus baccata, L.
Sesleria cærulea, Ard.
Festuca ovina, L.
Asplenium viride, Huds.
A. Trichomanes, L.
A. Ruta-muraria, L.
Cystopteris fragilis, Bernh.
Phegopteris calcarea, Fee.

Scar Woods.—These are a characteristic feature of the limestone dales, and are especially well developed round Kettlewell (Fig. 6) and Arncliffe. The lower scars are more favourable than the upper, but occasional examples occur on the higher scars and even on a limestone pavement on the plateau. The hazel is the dominant element most

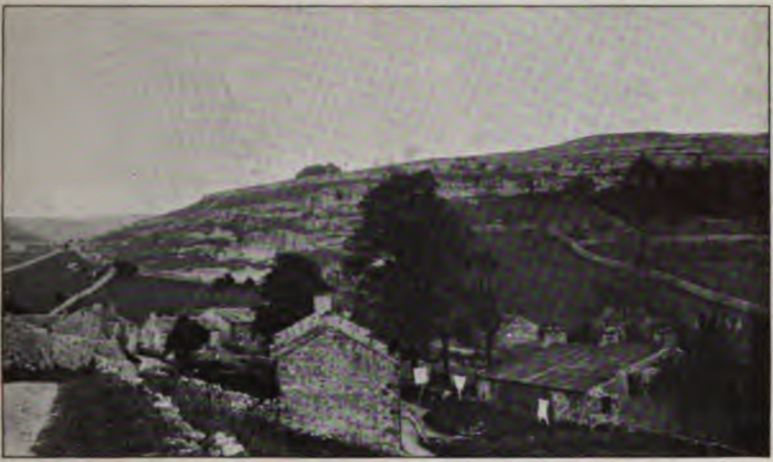

FIG. 6. Limestone scars and scar-wood at Kettlewell.

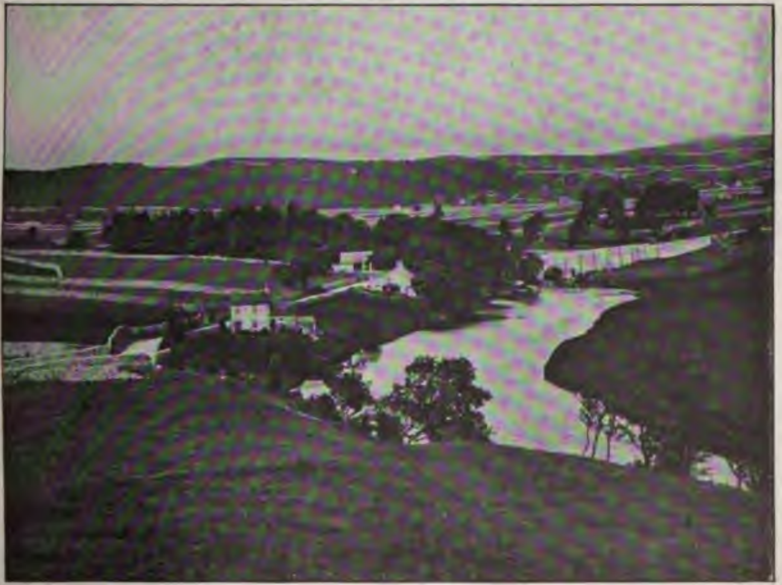

FIG. 7. The Wharfe at Grassington Bridge. Grass Woods in the background.

commonly found; but the ash occurs frequently, and sometimes close enough to reduce the hazel to a sub-dominant form. The scar wood is the highest zone of tree vegetation in the limestone area, and takes here the place of the birch zone of the Millstone Grit. Its occurrence on the map is indicated by the letter "A" over the wood colour. The number of ash trees present determines whether the hazel is to be a dominant or a sub-dominant form. As a rule the ash occurs but sparingly, because, being almost the only timber tree in the limestone dales, it is generally removed. In this district few of the woods receive any attention, and little is done to check disforesting. Almost all the scar woods are therefore to be regarded as shrubby thickets, under which the ground vegetation is only slightly shaded, but fairly well sheltered. Hazel, ash, mountain ash, hawthorn, and holly are the chief plants of the thicket. Sycamore occurs, but is not abundant. The ground vegetation is rich and varied. It is in this association that the almost extinct Lady's Slipper orchid occurs. The following plants are representative:—

TREES AND SHRUBS.

Corylus Avellana, L. Dominant.
Fraxinus excelsior, L.
Acer Pseudo-plantanus, L. Not abundant.
Prunus spinosa, L.
P. Padus, L.
Pyrus Aucuparia, Ehrh.
Cratægus Oxyacantha, L.
Ilex Aquifolium, L.
Rhamnus catharticus, L.
Rosa, spp.
Rubus idæus, L.
R. fruticosus (agg.).
R. saxatilis, L.
Cornus sanguinea, L. Local.
Sambucus nigra, L.
Viburnum Lantana, L.
Ligustrum vulgare, L.

GROUND VEGETATION.

Thalictrum collinum, Wallr.
Aquilegia vulgaris, L.
Actæa spicata, L.
Cardamine impatiens, L. Local.
Helianthemum Chamæcistus, Mill.
Viola odorata, L.
V. hirta, L.
V. Riviniana, Reich.
Hypericum hirsutum, L.
H. montanum, L. Local.
Geranium sanguineum, L.
G. sylvaticum, L.
G. Robertianum, L.
Spiræa Ulmaria, L.
S. Filipendula, L.
Saxifraga umbrosa, L. Rare.
S. hypnoides, L.
Sanicula europæa, L.
Galium boreale, L. Rare.
G. Cruciata, Scop.
Asperula odorata, L.
Cnicus heterophyllus, Willd.
Centaurea Scabiosa, L.
Lactuca muralis, Fresen.
Primula acaulis, L.
Primula acaulis X *veris*.
Polemonium cæruleum, L.
Lathræa Squamaria, L.
Origanum vulgare, L.
Teucrium Scorodonia, L.
Ajuga reptans, L.
Mercurialis perennis, L.
Listera ovata, R. Br.
Epipactis latifolia, All.
Orchis mascula, L.
Ophrys apifera, Huds.
Habenaria chloroleuca, Ridley.
Cypripedium Calceolus, L. Very rare.
Polygonatum officinale, All.
Convallaria majalis, L.
Allium Scorodoprasum, L.
Scilla festalis, Salisb.
Paris quadrifolia, L.
Luzula vernalis, DC.
Carex pallescens, L.
Sesleria cærulea, Ard.
Melica nutans, L.
M. uniflora, Retz.
Avena pratensis, L.
Polystichum lobatum, Presl.

WOODLAND OF THE LIMESTONES.

The limestone scar wood has already introduced some of the features of these woods. The woods of the Mountain Limestone and the Permian are so distinct that they cannot be included in either of the forms of oak wood already described on the non-limestone area. The oak is not abundant enough to merit recognition as the dominant element Pine woods are also by no means abundant on the limestone. The characteristic trees are ash and beech, the former on the Mountain and Permian limestones, the latter on the Permian only.

The ash occurs in the lowland oak woods, but its increase on the limestone is very marked. An opportunity for testing this opinion occurred in an excursion (May 18, 1901) in Upper Airedale: the trees were in foliage except the ash, which in its leafless condition was distinguishable from a long distance, and its abundance was convincing. The Rev. Mr. Shuffrey, of Arncliffe (1891), states that in Littondale, a limestone valley about 8 miles long, there are only seven or eight oaks. The ash is equally characteristic of the Permian tract, and on passing to it from neighbouring formations we have repeatedly observed a distinct increase in the proportion of ash trees in the hedgerows. It is also a conspicuous element of the Permian woods. The ash is generally recognized in forestry as a tree suited to limestone soils, and in Yorkshire this is amply confirmed. We have been told by the forester on the Duke of Devonshire's Bolton Abbey estate, that the ash of Grass Woods on the limestone is much superior to that in the sandstone woods.

The hazel is the forerunner and associate of the ash on the limestone. It is by no means uncommon on the sandstone areas, but its preponderance on the limestone soils makes it an important element. The dry nature of these soils is favourable to hazel and unfavourable to birch. The hazel copse is recognized in plant geography as a stage in the formation of forest, and as a rejuvenator of wood clearings. This is evidently the case in the scar woods already described. The hazel copse is in some cases the transition stage between the treeless scar *débris* and the forest condition; in other cases it is the evidence of disforestation of the ash. On the Permian tract the prevalence of hazel in many of the uncultivated places and disused quarries is similarly explained.

The following types of wood on the limestone have been observed:—

(1) The scar woods of the mountain limestone;
(2) The lowland woods;
(3) The hazel copse of the Permian tract.

Lowland Woods.—These occur on the Permian tract and in the bottoms of the Mountain Limestone dales. In Grass Woods near Grassington (Fig. 7) the transition from a scar wood to the lowland limestone wood is to be found. Bastow or High Grass Wood occupies the lower series of limestone scars, and is considered to be a scar wood altered by planting. Another extensive scar wood occurs on the opposite bank of the Wharfe, and it presents all the characters of the scar wood of Upper Wharfedale and Littondale. No scar woods occur lower down the Wharfe. The lower part of Grass Wood descends to the alluvial river terraces, which are here broad and mostly under cultivation. Beech, oak, sycamore, and other deciduous trees have been planted with a considerable admixture of Scots pine, larch, and other conifers. The character of the wood is altered, and the ground vegetation includes many plants which prefer more moisture and shade than is available in the upper scar wood. Amongst the associates, however, there are plants of the limestone, which become less frequent in the woods on the sandstone rocks. The latter occur on the Wharfe from Burnsall downwards, and have the characters already referred to in Bolton Woods.

The rich soils of the Permian, in conjunction with the favourable climatic conditions of a lowland district with a low rainfall, are suited to the growth of almost all trees. The woods are therefore varied in constitution, and no greater variety of native and introduced trees occurs in the present district than is found in the Permian woodland. Thus, in Studley Park, on the western edge of the Permian near Ripon, one may find good examples of almost all the woodland trees grown in Britain.

The prevalence of ash has already been emphasized, and although it forms no extensive woods, it is a conspicuous element in all. The beech is undoubtedly very abundant, and wherever a careful examination of the constitution of the Permian woods was made it was always one of the most common trees. The oak is not uncommon, but it is scattered amongst the other trees, and is rarely the dominant element it was in the lowland Coal Measure woods. With such a range of prevalent trees, the conditions offered to the ground vegetation vary from the deep shade of a beech wood to the open canopy of oak and ash. A complete list would include most, but not all, of the species given for the lowland oak wood (see Part I.). The following plants are characteristic of the Permian woods; others (placed in the second column) are more abundant there than in the lowland oak wood. On comparing the list with that of the scar wood of the Mountain Limestone, it will be seen that a certain proportion occur on both limestone formations, though rarer in the intervening sandstone woods.

LOWLAND MIXED WOODS.

Thalictrum flavum, L. Near water.
Aquilegia vulgaris, L.
Actæa spicata, L.
Viola hirta, L.

V. Silvestris, Reich.
Hypericum hirsutum, L.
Euonymus europæus, L.
Cornus sanguinea, L.

LOWLAND MIXED WOODS.

Inula Conyza, DC.
Atropa Belladonna, L.
Daphne Laureola, L.
Narcissus Pseudo-narcissus, L.
Polygonatum multiflorum, All.
Carex digitata, L.
Calamogrostis epigeios, Roth.
Scolopendrium vulgare, Symons.
Ranunculus auricomus, L.
Adoxa Moschatellina, L.
Neottia Nidus-avis, Rich.
Listera ovata, R. Br.
Epipactis latifolia, All.
Habenaria chloroleuca, Rid.
Convallaria majalis, Weber
Arum maculatum, L.
Carex sylvatica, Huds.
Festuca sylvatica, Vill.
Hordeum sylvaticum, Huds.

The prevalence of the beech on the Permian suggests that it may be native there. This is the opinion of Mr. Lees (1888), who considers it as a denizen on the other formations in West Yorkshire. Mr. Baker (1885) says, "The beech is less likely to be indigenous with us than the sycamore;" he regards it as a denizen in North Yorkshire. Mr. Robinson (1902) gives it as native in the East Riding: "the tree of the Wolds, and, although much planted now, is most likely aboriginal, as on the chalk further south." He also gives old place-names in confirmation. It seems, therefore, possible that in or near the eastern part of this district, the beech is indigenous. The subject is worthy of a fuller examination than we can give it here. Dr. Höck (1892), in a series of papers dealing with the associate-plants of beech forest, points out that these are difficult to distinguish from those of (1) the oak, and (2) the alder associations. This we have also experienced in Yorkshire. In order to determine the true associates of the beech, Höck examines the distribution of sixty-eight plants found in beech woods of Northern Germany, in comparison with that of the beech itself. He distinguishes twenty-one species which are closely co-extensive with the distribution of indigenous beech in Europe, from forty-seven species which have a wider distribution, and probably belong to the associations of the oak or alder. We have compared Höck's lists with the Floras of the West and East Ridings, and find that of the twenty-one close associates of the European beech forest, only ten are admitted as natives of the West Riding, while only eight are natives of the East Riding. Whether this method is the best one for determining the range of native beech requires confirmation; but if it is reliable, then it does not support the claim that beech is native in Yorkshire. The beech is, nevertheless, a common tree in the lowland woods, and grows well. It is also frequently found in the valleys, where it has been planted. In the valley of the Burn on Lord Masham's estate beech is successfully grown in close plantations with Scots pine and larch, up to an altitude of 850 feet. The highest altitudes for beech in this district are: 1000 feet (304 metres) between the Washburn and the Nidd, where it is planted with other trees in shelter-belts; and about 1300 feet (400 metres) at Malham Tarn House. On Rainstang, in Upper Nidderdale, there is a small clump planted by the roadside in an exposed position about 1350 feet; when or why these beeches have been planted we could not ascertain, but at present they are about 20 feet high, and have remained about this height for thirty years at least.

The Hazel Copse of the Permian.—The Permian soils are good farmland, and few uncultivated places large enough to show on the map are to be found. Hook Moor, near Aberford, is almost the only moorlike locality on the Permian. The vegetation found on it (see Part I.) is that of a grassy common, but the presence of indigenous shrubs indicates the rudiments of a copse vegetation. Uncultivated places of small extent are to be found along steep banks and in numerous disused quarries from which limestone was at one time extensively quarried. Wherever grazing is restricted, these waste places tend to become open thickets of hazel, hawthorn, bramble, and rose. In the conditions thus formed, there is a varied vegetation, which includes the following, as well as plants of the Permian pasture.

Corylus Arellana, L. Dominant.
Ranunculus Auricomus, L.
Helleborus viridis, L. Local.
Arabis hirsuta, Scop.
Reseda lutea, L.
R. Luteola, L.
Helianthemum Chamæcistus, Mill.
Viola odorata, L.
V. hirta, L.
Cerastium arrense, L.
Hypericum montanum, L.
Geranium sanguineum, L.
G. columbinum, L.
Euonymus europæus, L.
Rhamnus catharticus, L.
Ononis spinosa, L.
Anthyllis Vulneraria, L.
Astragalus glycyphyllos, L.
Rubus cæsius, L.
Rosa spinosissima, L.
R. mollis, Sm.
Cratægus Oxyacantha, L.
Saxifraga tridactylites, L.
Galium Mollugo, L.
Asperula cynanchica, L.
Scabiosa Columbaria, L.
S. arvensis, L.
Carduus nutans, L.
C. Crispus, L.
Centaurea scabiosa, L.
Hieracium Pilosella, L.
Ligustrum vulgare, L.
Blackstonia perfoliata, Huds.
Cynoglossum officinale, L. Rare.
Lithospermum officinale, L. Local.
Echium vulgare, L.
Atropa Belladonna, L.
Verbascum Thapsus, L.
Origanum vulgare, L.
Calamintha officinalis, Moench.
Listera orata. R. Br.
Orchis pyramidalis, L.
Ophrys apifera, Huds.
O. muscifera, Huds.
Carex sylvatica, Huds.
C. flacca, Schreb.
Bromus ramosus, Huds.
B. erectus, Huds.
Brachypodium pinnatum, Beauv.
Asplenium Ruta-muraria, L.

The Permian Hedgerow.—The hedges of the numerous old lanes on the Permian tract merit a passing glance, because they are a characteristic feature, and frequently enable one to determine with considerable accuracy the limits of that formation. In the upland districts of Yorkshire, there are few hedges and many stone walls (dark on the Millstone Grit, white on the Mountain Limestone), and behind these a limited number of plants are sheltered. The hedges of the lowland

Coal Measures consist chiefly of hawthorn, and are not rich in associates. The following are constituents of the hedges on the Permian :—

Clematis Vitalba, L. Rare.
Berberis vulgaris, L.
Euonymus europæus, L.
Rhamnus catharticus, L.
Acer campestre, L.
Rubus, spp.
Rosa, spp.
Prunus spinosa, L.
Cratægus Oxyacantha, L.
Bryonia dioica, Jacq.
Cornus sanguinea, L.
Viburnum Opulus, L.
V. Lantana, L.
Sambucus nigra, L.
Lonicera Periclymenum, L.
Fraxinus excelsior, L.
Ligustrum vulgare, L.
Convolvulus sepium, Junger.
Solanum Dulcamara, L.
Daphne Laureola, L.
Ulmus montana, Stokes.
U. suberosa, Ehrh.
Humulus lupulus, L.
Corylus Avellana, L.
Tamus communis, L.

The hedgerow vegetation is a composite one. Trees, shrubs, and climbing plants from the woods and copses make up the hedge itself. The undergrowth consists of plants from the woods and copses, weeds from the farmland fields and meadows, and ruderal or wayside plants. The elements of a hedge thus represent the common associations of a locality, and by observing them one may obtain information useful in a botanical survey.

C. THE FARMLAND OR AREA OF CULTIVATION.

The Board of Agriculture returns, already given in Part I., indicate the crops of the farmland. The rich warm soils of the Permian tract are amongst the best in the West Riding, and here the greatest proportion of arable land occurs. The soils on the Trias are so variable, from the presence of glacial or alluvial *débris*, that one finds fields capable of carrying good crops quite close to those with poor soils. This is very marked along the river Ouse, and round York rye is a common cereal crop, while everywhere rough derelict pastures may be found. West of the Permian, the grassland increases as the moorland is approached. The highest enclosed farmland occurs on the tract of limestone between Grassington and Pateley Bridge at an altitude of 1400 feet, and at the head of Nidderdale at 1500 feet (456 metres). The cultivation of wheat in this district is carried on almost up to the eastern edge of the moorland, and far up the bottoms of the dales. The occurrence of wheat cultivation so far up the eastern moor edge is partly due to the low annual rainfall, which along this tract is not much above 30 inches. The favourable exposure and the long undulating slopes are also important factors. The upper limit of wheat here varies from 600 to 700 feet. A crop in 1901 at High Skelden (700 feet) was a successful one. We have also a record on good authority that wheat is regularly and successfully grown at 800 feet at High Bramley Grange, near Masham. The climatic conditions of these eastern slopes seem suited for wheat, and, with a more favourable market, it could be grown on the better soils even higher than we have indicated on the map. In the dales, wheat is at present rarely grown. The records in Airedale round Skipton were kindly placed at our disposal by Mr. R. B. Cragg, who obtained them from old and trustworthy documents. Thus we have been able to give the wheat-limits in this neighbourhood with considerable accuracy. In Wharfedale the highest recent record obtained by us was at Ilkley, but from reliable information the wheat zone has been carried up to Burnsall, where it was grown about forty years ago. Mr. Cragg also obtained records of wheat cultivation on the alluvial lands by the Wharfe near Grassington. In Nidderdale it seems improbable that wheat was ever cultivated further up than Pateley Bridge; the limits shown on the map are based on our own recent observations.

The Permian Pastures.—In early summer the vivid bright green of the pastures, and the reddish soil of the ploughed fields of the Permian, are distinct from the darker pastures and soils of the Coal Measures. On the Permian pastures the grasses are short, and form a compact sward, which includes many plants besides grasses, the soil is easily warmed by solar radiation, and spring growth begins early. The Coal Measure soils, on the other hand, are retentive of water, remaining cool and moist, and growth begins later; the grasses are more tufted (*e.g.* Agrostis and Cocksfoot), and retain their dead leaves till early summer. The vegetation of an old Permian pasture contains many plants which grow best in dry well-drained places, and are either absent or rare on the adjoining formations. The pasture consists of plants able to withstand moderate grazing. In the absence of grazing, other plants appear, and the vegetation becomes that of a grassy common, like Hook Moor (Part I.), or that of the hazel copse.

The following are found chiefly on Permian pastures :—

Ranunculus bulbosus, L.
Polygala vulgaris, L.
Anthyllis Vulneraria, L.
Astragalus danicus, Retz.
Spiræa Filipendula, L.
Potentilla verna, L.
Poterium Sanguisorba, L.
P. officinale, Hook.
Saxifraga granulata, L.
Pimpinella Saxifraga, L.
Scabiosa Columbaria, L.
Senecio erucifolius, L.
Carduus crispus, L.
Cnicus eriophorus, Roth.
Campanula glomerata, L.
Primula veris, L.
Erythræa Centaurium, Pers.
Gentiana Amarella, L.
Rhinanthus Crista-galli, L.
Thymus Serpyllum, Fr.
Plantago media, L.
Orchis ustulata, L.
O. Morio, L.
Habenaria conopsea, Benth.
H. viridis, R. Br.
Allium Scorodoprasum, L.
A. oleraceum, L.
Colchicum autumnale, L.
Carex verna, Chaix.
Anthoxanthum odoratum, L.
Aira caryophyllea, L.
Trisetum pratense, Pers.
Avena pubescens, Huds.
Cynosurus cristatus, L.
Koeleria cristata, Pers.
Briza media, L.
Festuca elatior, L.
Bromus erectus, Huds.
Hordeum secalinum, Schreb.
Poa pratensis, L.

UNCULTIVATED LANDS.—Here and there amidst cultivation, patches of land are met with which have never been cultivated. The heaths or commons of the Millstone Grit and the Coal Measures have already been referred to in Part I. Examples also occur in this district. The uncultivated lands of the Permian are examples either of the hazel copse, the grassy pasture, or the Permian common.

AQUATIC AND MARSH VEGETATION.—The chief features of this in its upland and lowland aspects were given in Part I. In this district, however, there is a much better development of the lowland type. The rivers, after traversing the Permian limestone through wooded gorges, such as those at Knaresboro' and Boston Spa, pass on to a flat plain, through which they flow slowly and with many windings. Owing to drainage and cultivation, the aquatic and marsh vegetation is now almost restricted to small areas. Askham Bog, near York (not included in the present district), probably represents what was formerly a common feature in the Plain of York. It has been briefly described thus: "Pools bordered by flags, sedges, bulrushes, and marsh ferns, jungles of *Osmunda*, with birch, willow, and blackthorn. . . . The Bog is a tangled mass of flags and sweet gale, and various low-growing trees" (Rev. W. C. Hey, *Trans. Y.N.U.*, 1900). Within the limits of our map, the Ure from Ripon, and the Ouse with its tributaries, furnish good examples of aquatic vegetation. Still reaches of water offer suitable conditions for floating and submerged aquatics, and the reed-swamp of tall grasses and bulrushes, while willow thickets shelter many plants of the marsh. Representative lists have already been given in Part I., but in this district the species named are more abundant, and the number could be considerably increased. Amongst others which might be added are—the white and yellow water-lilies, and several species of *Potamogeton*; and of the marsh plants the greater spearwort (*Ranunculus Lingua*), marsh buckthorn (*Rhamnus Frangula*), marsh rue (*Thalictrum flavum*), and water-dock (*Rumex Hydrolapathum*). Further consideration of the aquatic and marsh vegetation is deferred, in view of its extensive occurrence in parts not included in our maps.

The geographical distribution of the vegetation in Yorkshire has now been described in two districts, including about a fourth of the county. These districts furnish a general view of the vegetation of the Pennine range and its eastern slopes. In each direction beyond our maps, the vegetation undergoes other changes in its distribution. It is, therefore, convenient to summarize the chief facts presented in Parts I. and II.

I. Farmland.

   A. With Wheat Cultivation: upper limits, 600 to 700 feet (182 to 213 metres), except in the dales.

   B. Without Wheat Cultivation: upper limits, 1000 to 1100 feet

(304 to 333 metres), with occasional extension up to 1500 feet (456 metres).

II. Woodland.

- A. Deciduous Woods :—
  1. Lowland Oak Wood and Mixed Deciduous Woods: upper limits, 500 to 600 feet (152 to 182 metres); occasional mixed woods (planted), up to 1000 feet (304 metres).
  2. Upland Oak Wood: upper limits, 800 to 1000 feet (243 to 304 metres); isolated oak, up to 1100 feet (333 metres).
  3. Birch Wood of Clough and Gill: upper limits, 1250 feet (380 metres); isolated trees, up to 1550 feet (470 metres).
  4. Scar Woods: upper limits, 1000 to 1200 feet (304 to 364 metres).
- B. Pine Woods: upper limits, 1250 to 1400 feet (380 to 424 metres).

III. Moorland.

- A. Natural Pasture (Limestone): upper limits, 1500 to 1746 feet (456 to 530 metres).
- B. Heaths :—
  1. Grass Heath: upper limits, 1000 to 1500 feet (304 to 456 metres).
  2. Heather Moor: upper limits, 1250 to 1660 feet (380 to 503 metres).
- C. Cotton-grass Moor: lower limit, about 1250 feet (380 metres), upper limits, 1500 to 2000 feet (456 to 606 metres).
- D. Summits :—
  1. Vaccinium: upper limits, 1500 to 1900 feet (456 to 576 metres).
  2. Alpine pasture: lower limit, 2000 feet (606 metres), upper limit, 2300 feet (700 metres).

The following natural zones of altitudinal range of vegetation are indicated from the above :—

(1) Zone of Wheat Cultivation and Lowland Oak Wood: upper limit, 500 to 700 feet.

(2) Upland Oak Wood and greater part of Cultivation without Wheat: upper limit, 900 to 1000 feet.

(3) Birch Wood and Pine Wood: upper limit, 1250 feet, which is also the lower limit of the cotton-grass moss.

(4) Heather Moor, Grass Heath, and Limestone Pasture: upper limit, 1500 to 1600 feet.

(5) Cotton-grass moss and Vaccinium Summit: upper limit, 1800 to 2000 feet.

(6) Alpine Pasture, from 2000 to 2300 feet.

In conclusion, we hope that the contribution contained in these two papers may have advanced knowledge in regard to the plant-geography of Yorkshire, and may have suggested methods of observation applicable elsewhere. Defects and oversights must exist, but we have tried to reduce them to a minimum, and trust that they do not affect the main features of the survey.

REFERENCES.

Baker, John Gilbert.—(1885.) "North Yorkshire: Studies of its Botany, Geology, Climate, and Physical Geography." 2nd edit. *Trans. of Yorks. Nat. Union*, 1885–1891. The work is complete up to Grasses, but further parts are to be published. Apply, Hon. Sec. Y.N.U., Museum, Hull.

Buchan, Alex.—(1898.) "The Mean Atmospheric Pressure and Temperature of the British Islands." *Journ. Scot. Meteorol. Soc.*, vol. xi.

Davis, J. W., and Lees, F. Arnold.—(1880.) 'West Yorkshire: Geology, Physical Geography, Climatology, and Botany.' London.

Graebner, P.—(1901.) 'Die Heide Norddeutschlands.' Part v., Engler und Drude, 'Vegetation der Erde.' Leipzig (Engelmann).

A Review, with special reference to work in Britain, by W. G. Smith, *Scot. Geogr. Mag.*, November, 1902.

Hock, F.—(1892.) 'Begleitpflanzen d. Buche.' *Botan. Centralblatt*, lii., 1892, p. 353. Also other papers.

Lees, F. Arnold.—(1880.) See Davis.

——— (1888.) 'The Flora of West Yorkshire.' London, 1888. See also Davis.

Lucas, Joseph.—(1881.) 'Studies in Nidderdale.' Notes from 1869–1872, Pateley Bridge (Thorpe). A summary of the observations on trees is given in *Proceedings of Yorks. Geological and Polytechnic Soc.*, 1881.

Miall, L. C.—(1878.) 'The Geology, Natural History, and Antiquities of Craven, in Yorkshire.' Leeds (Dodgson), 1878.

Robinson, J. Fraser.—(1902.) 'The Flora of the East Riding of Yorkshire.' London and Hull (Brown), 1902.

Rotheray, Lister.—(1900.) 'Flora of Skipton and District.' Skipton, 1900.

Shuffrey, Rev. W. A.—(1891.) "Flora of Littondale." *Naturalist*, February, 1891. Also included in 'Littondale Past and Present.' Leeds (Jackson).

Smith, Wm. G., and Moss, C. E.—(1903.) 'Geographical Distribution of Vegetation in Yorkshire.' Part I. Leeds and Halifax District. The *Geographical Journal*, April, 1903. Pocket Edition—J. Bartholomew & Co., Edinburgh.

Yorkshire Naturalists' Union, Transactions of. Hon. Sec. Y.N.U., Museum, Hull.

THROUGH THE BARREN GROUND OF NORTH-EASTERN CANADA TO THE ARCTIC COAST.*

By DAVID T. HANBURY.

Fort Resolution, near the mouth of the Great Slave river, may be taken as the starting-point in this sketch of my journey through the Barren

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* See map, p. 236.

Ground of North-Eastern Canada. From this station, on July 13, 1901, I and the two companions whom I had engaged set out in two light canoes, with a small scientific equipment and with only such supplies as were strictly necessary for the earlier part of the journey. For the expedition to the arctic coast I had arranged that ample stores should be waiting in winter on board a whaling schooner, the *Francis Allyn*, somewhere near the mouth of Chesterfield inlet, probably at Marble island.

The first evening we camped on Stony island. In crossing the lake we passed a long group of small islands, which I had not seen on any map. On the north shore, as we paddled along, we found traces of the gold bubble which had risen and burst a few years before. On July 20 we reached the eastern end of the lake. Then we made the nine portages, one of them 2½ miles long, and on the 23rd reached Artillery lake, whose lovely blue waters rippled in bright sunshine, while on either hand the so-called Barren Ground stretched green and gay with numberless wild flowers. Ascending the stream which flows into the lake, we reached the watershed on the 27th, and in the evening camped on Campbell lake, on the headwaters of the Ark-i-linik. The divide is only a low moss swale, about 300 yards across, where one could just observe the water trickling here to the west, there to the east. Next day we reached the irregularly shaped lake which I have called Abbott lake, and, on the following morning, proceeded down the western branch of the Ark-i-linik. A few miles east of Abbott lake, I found, as I had found in 1899, that my compass would not work; but after trying a few blind inlets, we made out the proper course. On the 29th we saw the first of

VIEW OF TYPICAL COAST, BARREN GROUND.

the spruce trees which distinguish the Ark-i-linik down to about 20 miles west of Ti-bi-ilik lake, forming in many places a belt or fringe of woodland, the trees being sometimes as much as 2 feet thick at the ground.

On August 2 we reached a portage where the river cuts its way through felspathic granite (quartz in some places, in others biotite), whose beds dip at an angle of 60°. At the foot of the portage the formation changes to white sandstone, which continues with little interruption to the mouth of the main river. By August 5 we had passed all the portages, including that at a fall 30 feet high, and commenced (August 6) the descent of the main river.

On the 15th, near Ti-bi-elik lake, we met the first Eskimo, or Huskies, as I shall call them. Descending the lake, which is 13 miles long and 5 or 6 miles broad, we reached the mouth of the Dubawnt river, whose name is then given to the united stream. Accompanied by two Huskies, we held on our way, and on the 20th reached Udi-uk-tellig, a Husky camp, where, in conversation with my old friend Amer-or-yuak, I recovered my knowledge of the Husky language. We were detained by rain and wind (north-north-east and north-west), usual at this season, till August 25, when we resumed our journey. The river connecting with Baker lake is wide, deep, and swift, with steeply sloping banks, the country, especially on the north, being hilly and rocky. Halfway down the lake we were delayed by bad weather, then we had fog; but, steering by compass, we reached Maur-en-ek-uak, at the foot of the lake, on September 3.

Here the tide from Hudson bay rises 6 or 8 feet. Chesterfield inlet commences about 20 miles further down, at the end of the southern outlet of Baker lake. This channel, the last portion of the Dubawnt river, is deep, and the water flows with a strong current. With a fair wind we descended the inlet in three days, and (September 8) camped on the mainland coast, south of Fairway island. Back from the coast the land was undulating, stony, and rocky, dotted with small lakes and moss swamps. Birds (ducks, etc.) were numerous, and one day I stalked and shot a swan belonging to one of the flocks I had seen overhead. Having gone southwards looking for the whaler, we set out, on September 17, in calm weather, and crossed the channel (about 10 miles) to Marble island, rounded its south-western point, and entered the narrow passage leading to the harbour, but no ship nor any living creature was there, though barrel hoops and staves were lying about, and there were many graves. The island is of quartzite, white at a distance, but rusty or yellow close at hand. The harbour is good, except that its anchorage is insufficient, and we saw a track leading up the rocks to a small fresh-water lake.

Returning to the mainland, we resolved to go back, in the mean time, to Baker lake. Near the coast we found indications, chiefly in the form

VIEW OF THE COUNTRY ON KENT PENINSULA.

VIEW OF MOUNT HAR-LI-AR-LI (BASALT), KENT PENINSULA. ALTITUDE, 360 FEET.

of old Husky camps, that the Hudson bay Huskies are less numerous than formerly, and my inferences on this subject were confirmed by Amer-or-yuak. Proceeding up the inlet, I met at Nell-yuk-yuak, on September 28, Uttungerlah, an old Husky friend, and received from him letters which informed me that the *Francis Allyn* was lying at Dépôt island, a small, low rocky islet about 40 miles north of the mouth of the inlet. He had come in one of the whale-boats, and in this craft I reached the whaler on October 2. Three days later we set out in a fully laden whale-boat, and took a short cut along a shallow channel dug by the Huskies behind the peninsula (which maps do not show as a peninsula) at the north-end of the inlet, thus saving 20 miles. On October 12 we reached the Husky camp at the foot of Baker lake, and landed through heavy slob ice, just in time, for next day the river was frozen thick.

In the winter we had several hunting expeditions, one being towards Pelly lake, over new ground, which in this brief sketch I must leave undescribed.

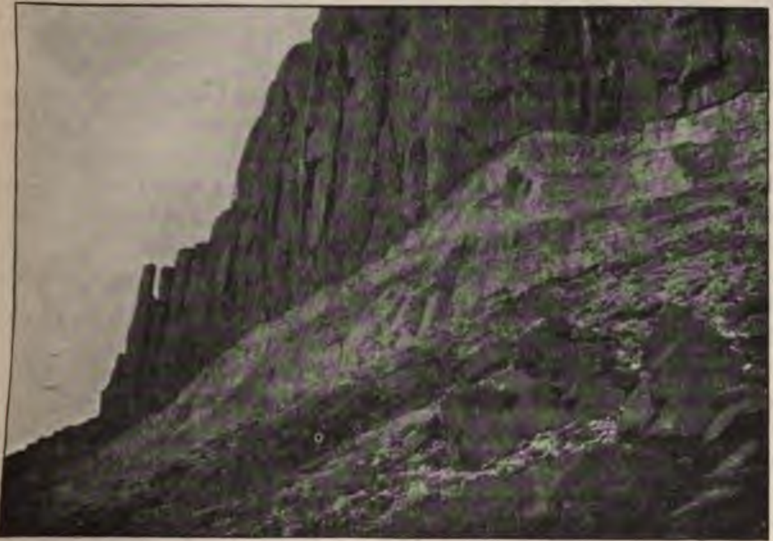
My next move (December 26) was towards the *Francis Allyn*, where I had to prepare for the journey to the arctic coast. I made arrangements with Amer and Uttungerlah for their company to the north, settled on the route and other details, and then went to fetch the supplies. From the head of Chesterfield inlet to the ship the direct distance was about 140 miles, which, in travelling, we made about 180. The country was flat or undulating, and contained lakes, but neither our going nor returning need be described here. For the month of January, 1902, the mean temperature was $-30^{\circ}\cdot5$ Fahr., and the lowest reading for the whole winter was -57° Fahr.

On March 9 we started on our long journey from the foot of Baker lake with two sleighs laden with stores, and a third carrying two canoes "nesting" on a frame, the three being drawn by twenty dogs. All of us walked, even the women and children who were to accompany us to Pelly lake. We went by easy stages, and on the 16th reached King-ak, near the lake-head. Here the minimum temperature was -51° Fahr. The whole southern shore of the lake is low, but about 2 miles to the south, a ridge parallel with it runs from near the Kazan river to King-ak, and opposite the middle of this ridge, but 8 or 10 miles to the south, is a conspicuous hill called No-a-shak.

King-ak stands on a bay, into which flows a very small stream. This is probably the place referred to by Captain Christopher, sent in 1761 to ascertain whether a north-west passage could be found by Chesterfield inlet. He mentions, as at the head of a large fresh-water lake (Baker lake), "a small river full of falls and shoals, not water for a boat," and seems not to have seen or heard of the Dubawnt river.

Travelling slowly past the shores of Schultz lake and Aberdeen lake, we reached Ti-bi-elik lake on April 3. Here three thermometers

MOUTH OF THE COPPERMINE RIVER.



PRECIPITOUS COLUMNAR BASALT OVERLYING LIMESTONE, PORDEN ISLANDS, BATHURST INLET.

gave 211°·4 as the boiling-point, the temperature of the air being 32°, so that the altitude was about 313 feet. On April 5 we crossed the lake (6 miles), and next day set out due north, intending to follow the meridian of 101° as nearly as we could by dead reckoning. The country was flat, without rocks *in situ*, but red sandstone *débris* appeared. In 9 miles we found only one lake. Further on (April 7), the sandstone *débris* gave place to granite boulders and fragments. The boiling-point of two thermometers here was 211°, the air being at 28°, so that the altitude was about 515 feet.

On the 8th we crossed two small lakes and a low ridge, apparently dividing the waters flowing south from those flowing north to Back's river. The country was still flat, with low ridges and sand-hillocks. Next day we struck and followed a river flowing north. It proved to be the Buchanan, with banks usually low and sloping, but high in some places, with sandy hills back from either side. The ice on the river was 7 feet thick. On the 10th we camped in snow huts on a lake, to the west of which was a flat-topped gravel hill about 120 feet high. As we descended the river, its bed of granite boulders widened, and was now from 300 to 600 yards across. I could not determine my longitude, and was puzzled by the discrepancies between Tyrrell's map and the latest Admiralty chart, the mouth of the Buchanan being put on the former at 102° 10′ W., and on the latter at 103° 10′ W.

On April 12 we fell in with a Back's river Husky, who took us to his camp. On the 14th we left the Buchanan, and, going 5 miles north-east, reached the south-west shore of Pelly lake, across which we travelled 6 miles to the north shore. Here the boiling-point given by two thermometers was 211°·5, the temperature of the air being 30°, so that the altitude was about 260 feet. We searched for, but, owing to fog, did not find, a stream which we were told flows into Pelly lake from the north. On the 18th we followed an arm of the lake running north; then struck north and north-north-west, where the land became rugged with granitic rocks. On the 17th the maximum temperature had reached 32° Fahr., and on the 20th 36° Fahr. On the 21st an observation of the meridian altitude of the sun showed we were in lat. 66° 25′ 25″ N. Here the boiling-point was 211°·2, the air being at 29°, and the altitude therefore about 414 feet.

Then the country became flat, and on the 22nd we reached Te-her-uak lake (but this seems to be a common word for "lake"). Travelling 8½ miles from about the middle of the shore, we reached the foot of the lake, which, confined within low rocky shores, was irregular in shape, and contained many rocky islands. Next day we found the outlet, marked with stones set on end by Huskies. As we travelled northwards, April 23, it was difficult to tell whether we were on the river, or on lakes or moss swamps. An observation gave our latitude as 66° 42′ N., so that from Ogden bay in 67° 36′ N. we were distant 54 geographical

COPPERMINE RIVER.

miles. The rocks here were pinkish felspathic, smooth, but not striated so far as we observed. On the 25th we travelled on the river and lakes across a barren country with neither moss nor lichen, but we found heather for fuel. For several days we were detained by blizzards, but on May 1 we continued our way down the river past several frozen rapids, the rocky banks being sometimes 20 feet high. On May 2 we were in lat. 67° 18′ N. We made long halts to avoid outstripping the deer in their migration to the north, and on one of these days I killed two arctic hares on rough broken ground. On the 8th we were nearly at the sea-level, two thermometers giving 212° as the boiling-point, and one 212°·1.

On the 10th we were about 67° 26′ N., or about 10 geographical miles from Ogden bay, and I sent two Huskies north to prospect, giving them presents for the coast natives. Next evening they returned, bringing with them two coast Huskies, tall, strong, quiet men, differing in no way but in the cut of their clothes from the Hudson bay men. They seemed timid at first, but gained confidence, gave me much information, and agreed to accompany us.

On May 12 we were in lat. 67° 29′ and two days later we struck the arctic coast in lat. 67° 44′; and (as I subsequently puzzled out) at a spot a little to the west of McTavish point. The river had widened out, and the land was very low. Seven miles out on the ice we found a Husky camp of two snow huts, or "iglûs," and three tents, containing five families and some visitors, forty-five persons in all. From that point our direction was westwards. Setting out on the 16th, we passed many bare, rocky islets, the distant mainland coast being visible as a low undulating ridge. On the 17th we camped beside rocky islets showing deep grooves and striæ, and broken off abruptly to the north. Other two days' travelling brought us to the tents of Huskies, strangers to my Arctic coast companions, and bearing a marked resemblance to the Mongolian type. They were friendly enough, but did not invite us into their tents. On May 22 I found we were in lat. 68° 5′. Here we boiled three thermometers, which showed respectively 212°, 212°·1, and 212° as the boiling-point.

After being detained by blizzards, we cut across White Bear point, and held for two days westwards, inclining slightly to the north. On May 27 we camped in our tent on the west of the portage across Bear point, and on the 28th, at some island rocks to the west of Dease point, we saw the midnight sun for the first time, though it had been visible

SMALL WATERFALL COMING INTO THE COPPERMINE RIVER.

THE DIVIDE BETWEEN GREAT BEAR LAKE AND THE COPPERMINE RIVER. VIEW LOOKING NORTH TOWARDS DISMAL LAKE.

some days earlier. The mainland to the south seemed high and rocky; Melbourne island appeared as a long low streak to the north.

On May 29 I found our latitude was 68° 29′. That day we reached the east coast of Kent peninsula, where Huskies were busy catching codling with copper hooks through holes in the ice. The weather was now warm; the blazing sun melted the snow on the land, pools of water lay on the ice, and birds and beasts became more numerous.

The little inlet from Labyrinth bay on which we were camping was almost too small to have a name, but as, from its position, it seemed to deserve one, I called it Portage inlet. From its head there is only one mile's distance overland to It-ib-lair-yuak lake, which is 6 miles long, and has at its west end an outlet flowing into the inlet E-lu from Warrender Bay, on the west side of Kent peninsula, which is thus almost an island. With exception of the one-mile portage, there is an excellent canoe route, not only much shorter, but more sheltered than that round Kent peninsula.

We resumed our journey on May 31, and camped at the foot of the lake in a rocky country. A mile to the south-south-west was a basaltic hill (Har-li-ar-li) 360 feet high, as I made out by the Watkin aneroid, and precipitously cut on the east and south. On the ridges and hills here beds of marine shells were noticeable. Travelling along the south shore of the inlet E-lu, we passed on June 4 a hill called U-wei-yu-ullu, and on June 6 a similar hill, both being precipitous nearly all round, and though less than 600 feet high, very prominent landmarks. About 9 miles further on, the E-lu inlet, which is about 12 miles across at its widest part, contracted to about 1½ mile. The following day (June 7), after going 8 miles, we reached Warrender bay. The entrance to E-lu inlet is obscured by islands overlapping one another, and this fact accounts for its having been passed unnoticed by the surveyors of Melville sound. Crossing Hope bay, we went S. 30° W. to the high and rocky south shore of Melville sound, travelling 22 miles over smooth ice, on which a Husky killed five arctic hares with his bow and arrow. On the 8th we travelled west along the coast of the sound, and camped at a creek with a shoal sandy beach, where there was a Husky encampment called Sarker-wark-tûk. A longish hill, 840 feet high, overlooked our camp. Dwarf black birch was abundant.

On the 15th I and two Huskies on a sleigh set out for Barry island (Iglor-yu-ullig), and next day reached its north shore. We found two small pieces of copper, and the rock formation showed that the metal was abundant and widely distributed. In returning (June 18) we made for the nearest land on the eastern shore of Bathurst inlet, and, crossing mountainous ground, reached our camp on the 19th. On the 22nd we journeyed 18 miles westwards, and camped on the west side of Cape Croker, which is an island separated from the mainland by a channel half a mile wide. Next day, in crossing Bathurst inlet, we reached a flat-topped precipitous island, basaltic, but with a bed of limestone as much as 60 feet thick underlying the columnar basalt. On the 25th, passing many other islands, we reached one where we searched for copper, and, though we found little, saw from the stains on the rocks that copper was present. On the 27th, at the north-west point of Lewes island, we found copper in flakes wedged vertically in the rocks, and also in small chunks. We picked up between 2 and 3 lbs. in less than three-quarters of an hour. The rock was easily cleft by a slight tap with an axe. The summer was now well advanced, birds, butterflies, and flowering plants being common.

On the 29th we reached Cape Barrow, off which are precipitous basaltic islands, and inland from which the country is rugged. Next day, 8 miles along the coast, at Utkûshik Karlûk, we found a soft stone from which the Huskies make kettles (*Utkûshik*). It occurs, grey and powdery-looking, among granitic rocks. On July 1 we camped a short distance east of Uni-a-lik, a river with a reputation for salmon. Here, in Gray bay, the ice was very rotten; but next day, beyond Hepburn island, the ice was good. As we advanced, however, it got worse. We all went through it several times, and the cracks became so wide that in crossing them we had to launch a canoe. Two of us were suffering from snow-blindness, and when less than 60 geographical miles from the Coppermine river mouth, I resolved to wait for open water. On the 12th we set out in the canoes, but the strip of open water was not continuous, and it was not till the 18th that, after many portages, we reached the Coppermine.

Next day we paddled 9 miles up to Bloody fall, where we found a Husky camp, from which the occupants had fled on our approach, leaving everything behind. The stone kettles with boiled salmon were still warm. I took some half-dried salmon, and left for payment knives, files, needles, etc.

The fall is in fact a rapid, requiring half a mile's portage. Above this is a stretch of shoal (now and then deep) water with a swift current, which it took us all day to ascend, wading and walking the canoes. Higher up there were rapids, where the water was too swift for paddling and too deep for poling, and where the steep banks gave no footway for tracking, so that portaging could not be avoided. At such places it took all six of us to handle a canoe. We ascended the river for about 100 miles to the place where, nearly opposite each other the Mouse river and the Dismal Lakes river flow into the Coppermine. The river to the west offered fair canoe navigation, and we reached the Dismal lake (there is only one) on August 1. About 12 miles to the north-west we found the narrows, in lat. 67° 21′ N., as I made out. The altitude of the lake is about 860 feet, which is also, within a few feet, the altitude of the divide between the Coppermine and Great Bear lake waters. The portages across the divide were numerous and lengthy, and after having passed them I bade good-bye to the three Hudson bay Huskies who had attended me so far.

CAÑON AT MOUTH OF KENDALL RIVER.

On July 29 and August 3 the maximum temperature was 65° Fahr., the highest registered during the journey. I wished to connect the survey of the east end of Great Bear Lake with that of the Coppermine, but scarcity of food and the difficulty of the shoal and stony Dease river required that we should push on. On the 19th we reached Great Bear lake, and on the 30th the long journey ended at Fort Norman, on the McKenzie river.

Generally speaking, the geology of the northland of Canada is not of a very interesting character, except perhaps to the student of glacial phenomena.

Plutonic rocks, granite for the most part, prevail. However, I came on limestone on the arctic coast, but I failed to discover any fossils, though I searched diligently for them. Large quantities of native copper were found on the islands in Bathurst inlet. It was in basaltic formation. I may be wrong about this, as my collection of geological specimens has not been examined yet. As it will be some time before I shall have finished writing up my notes, I have written the following short *resumé* of the different formations met with.

At the foot of Baker lake (Maur-en-ek-uak on my map), red or brown sandstone, classified Cambrian by the Canadian Geological Department. No fossils have ever been discovered. Between the north shore of Baker lake and Lake Garry on Back's river, the usual plutonic rocks occur, chiefly felspathic granite. About 20 miles south of Lake Garry are some exposures of white or grey quartzite, similar to that found on Marble island, which has been reported upon by Dr. Bell (Canadian Geological Survey Department). This quartzite is classed Huronian. As we approached Lake Garry, exposures of rock became less frequent; the land is of a sandy nature, and small sand-hills numerous. Between the head of Chesterfield inlet and Depot island (near Whitney inlet, on the coast of Hudson bay) are massive granite rocks, and the country is rugged.

Starting from the north shore of Ti-bi-elik lake, we travelled over flat or undulating country for 20 miles; no exposures of rock were seen, but sandstone *débris* scattered around. We then came on granitic boulders, but still no rock *in situ*. A short distance further north there was an outcrop of grey quartzite (Marble island). We then struck the headwaters of Buchanan river, a tributary flowing north into Back's river. Along Buchanan river are no rocks *in situ*; land sandy. Granitic rocks are *in situ* on Buchanan river, close to its junction with Back's river. North of Pelly lake, felspathic granitic occurs, smoothed but not striated by glacial action. A similar formation is found right up to Ogden bay on the arctic coast. The granite varies considerably in composition. Felspar is so much in the ascendant in some cases, that the whole country has a pink appearance; in other cases, hornblende is in the ascendant; in others, quartz. The rock is highly crystalline in most cases. Schists are conspicuous by their absence. Plutonic rocks are in evidence all along the arctic coast to Kent peninsula.

A peculiarity which I have noticed in a great many places on the northland of Canada is the occurrence of beds of shells (marine), on the tops of hills or raised spots at altitudes varying from 50 to 500 feet above the sea-level. These beds of shells were very common on Kent peninsula. Specimens of these shells, which I brought back on my last journey, and which were found to the south of Baker lake, were named for me by Dr. Dawson—*Laxicava rugosa* (L.), *Pecten Islandicus*, *Astarte Banksii*, var. *striata*, fragments of Buccinum and Balanus. It has always been a puzzle to me to account for the presence of these beds of shells. I quote from Lyall, p. 168. "The occurrence of patches and beds of marine shells at altitudes varying from a few feet to 500 feet is probably due, *i.e.* their present elevated condition, to the action of great glaciers or ice-sheets pushing up portions of the sea-floor, possibly in a frozen condition, to the hill slopes on which they are now to be found."

Basalt was observed on Kent peninsula, which continues with breaks almost to the Coppermine river. Native copper is always vertically placed in basaltic formation, much disintegrated, and easily broken up. This formation, containing larger or smaller quantities of native copper, prevails on all the islands in Bathurst inlet (or rather, I should say, all that I visited). I have several specimens of this rock, showing exactly how the copper occurs. It is generally in the form of flakes which are always wedged in vertically, never horizontally. Why this should be so I shall not venture to guess. The copper is also found in lumps or nuggets, some of them very large.

Near Lewis island, in Bathurst inlet, is a bed 15 feet thick of limestone underlying 20 feet of basalt; no fossils in the limestone. In the islands north of the Cape Barrow limestone was seen, but not visited. Eight miles west from Cape Barrow, and about 5 miles inland, there is a spot or patch of soft grey rock, which occurs in felspathic granite formation. I call this rock kettle-stone, for it is the stone used by the Eskimo to make their stone kettles and oil lamps. It is most peculiar and its presence and origin are not very apparent. It is quite soft, and can easily be cut with an axe or knife. It may be the result of the kaolinization of the felspar, caused by deep-seated chemical action. I do not advance this theory, however. Why it should occur at certain spots, or at all, is a geological puzzle. I have specimens of this rock, which is *in situ*, and also a kettle and a lamp made out of it.

The geology along the Coppermine has already been reported upon, I believe. No signs of gold were seen. The only other metal, other than the native copper met with, was iron, which is common everywhere in small quantities.

THE TERMINOLOGY AND NOMENCLATURE OF THE FORMS OF SUB-OCEANIC RELIEF.

THE first meeting of a Committee of the Sixth International Geographical Congress appointed at Berlin in 1899 to consider a scheme of international nomenclature for the forms of sub-oceanic relief was held in the Hotel Nassau, Wiesbaden, on April 15 and 16, 1903.

There were present, H.S.H. The Prince of Monaco; Prof. O Krümmel, Kiel; Prof. A. Supan, Gotha; Prof. O. Pettersson, Stockholm; Prof. Thoulet, Nancy; Dr. H. R. Mill, London. M. Sauerwein, aide-de-camp to the Prince of Monaco, acted as secretary of the Committee. Sir John Murray and Dr. Nansen, members of the Committee, were unable to be present.

The Committee was charged with two duties—

(1) To draw up an authentic map of the oceans, embodying the results of all existing deep-sea soundings, for presentation to the Seventh International Geographical Congress at Washington in 1904.

(2) To consider a system of international terminology and nomenclature for the larger features of sub-oceanic relief.

(1) Prof. Thoulet brought forward a scheme for constructing a chart of the oceans on the equatorial scale of 1: 10,000,000 (approximately 160 miles to an inch), two different projections being adopted. From 72° S. to 72° N. the chart would be on Mercator's projection, and would comprise twenty-four sheets. From 72° to the poles the gnomonic projection would be employed, each polar area including four sheets, so that the whole map would consist of thirty-two sheets of a convenient size. All soundings of greater depth than 1000 metres would be entered upon the chart, and isobathic lines drawn so far as the data warranted. The unexplored part of the oceans would be left without isobathic lines, and it was proposed to issue the map uncoloured. It was understood that the Prince of Monaco would be responsible for the production of this map, should the Washington Congress approve of the scheme.

After a prolonged discussion of the scale and the projections, the Committee unanimously resolved to recommend the Congress to adopt Prof. Thoulet's scheme in its entirety. It also recommended that the data of the new map should be published on an equivalent area projection on a smaller scale, suitable for the use of oceanographers in plotting various distributions for the purpose of measuring areas. It was suggested that this might be undertaken by private enterprise.

(2) As regards terminology, it was resolved to ask the German members of the Committee to draw up definitions of the terms used for the more important forms of sub-oceanic relief, and to communicate them to the other members for consideration and for consultation with other geographers. When the definitions are adopted, the Committee should decide as to exact equivalents of the terms in French and English.

It was resolved to recommend that for the larger features names descriptive of their geographical positions should be exclusively adopted, as has been done in Prof. Supan's bathymetrical chart published in 1899. For smaller features and for special points the names of persons or of ships might be freely used.

The following is the terminology (with definitions) of the most important forms of sub-oceanic relief, proposed by Prof. Supan, with the English equivalents suggested by Dr. H. R. Mill, and the French by Prof. Thoulet.

I. THE GREATER FORMS.

1. The **Shelf** (Ger. *Schelf;* Fr. *Socle* or *Plateau continental*) is the only form of the continental border which is of independent importance. It is the portion of the continental border which extends seaward from tide-marks, sinking very gradually, as a rule, to the depth of about 100 fathoms or 200 metres, and then suddenly falling steeply to a great depth. Examples: the British, Sunda, and Newfoundland shelves.

2. The **Depression** (Ger. *Vertiefung*) is enclosed on all sides by elevations of the sea-bed.

(*a*) The *Basin* (Ger. *Becken;* Fr. *Bassin*) is a depression of approximately round form, in which the horizontal diameters are about equal.

(*b*) The *Trough* (Ger. *Mulde;* Fr. *Vallée*), an elongated and wide depression, with gently sloping borders. A trough may be divided by transverse elevations into basins, as, for example, in the Atlantic.

(*c*) The *Trench* (Ger. *Graben;* Fr. *Ravin*) is also an elongated but proportionally narrow depression, with steeply sloping borders, one of which (the continental) rises higher than the other (the oceanic). Trenches are the ends of unsymmetrical basins, and lie beside the continental border or island chains. The Cayman trench alone runs between islands, but in its case also the borders are of unequal height. Strictly speaking, the trench is only a secondary form of the great depressions of the ocean floor, but on account of its considerable length, its depth, and its genetic importance, it may well be reckoned as one of the principal forms.

The extension of a trough or basin which penetrates the land or a submarine elevation, either with a uniform or a gradually diminishing depth, or which is bounded on the one side by land and on the other by a submarine elevation, may be—

(*a*) An *Embayment* (Ger. *Bucht;* Fr. *Golfe*), if wide, and of a rounded or triangular form, as, for example, the East Australian embayment.

(*b*) A *Gully* (Ger. *Rinne;* Fr. *Chenal*), if long and narrow (*e.g.* the Färoe gully, the Norwegian gully).

3. The **Elevation** (Ger. *Erhebung*) is either entirely surrounded by depressions or is a prolongation of the continental border.

(*a*) The *Rise* (Ger. *Schwelle;* Fr. *Seuil*) is an elevation which rises gradually with an angle of only a few minutes of arc, irrespective of whether it is wide or narrow, or of its vertical development. On account of its flatness the rise apparently plays only a subordinate part, but rises carry the chief features of suboceanic relief, so that if the ocean floor was changed into dry land they would act as the main watersheds.

(*b*) The *Ridge* (Ger. *Rücken*; Fr. *Crête*) is a relatively narrow elevation which is prominent on account of the steep angle at which it rises. It is thus narrower than an extended rise, the distinction being clear where a rise assumes in some parts the character of a ridge, as, for example, the Atlantic equatorial ridge. The category of ridges includes both greater and minor forms.

(*c*) The *Plateau* (Ger. and Fr. *Plateau*) is a steep elevation of large extent in which the length and breadth do not greatly differ. It may rise from the depressions of the ocean floor, or from a rise (*e.g.* the Azores Plateau).

4. A *Deep* (Ger *Tief*; Fr. *Fosse*) is the deepest part of a depression (*e.g.* the Nero Deep). A *Height* (Ger. *Höh*; Fr. *Haut*) is similarly the highest part of a rise, ridge, or plateau, if it does not belong to the base of an island or is classed as an independent minor form (*e.g.* the Valdivia Height on the Walfisch Ridge).

II. MINOR FORMS which are of smaller extent, but, on account of steeper slopes, clearly distinguished from their surroundings, include—

1. **Elevations**:

(*a*) Elongated elevations usually of irregular surface: Ridges.

(*b*) Single elevations or submarine mountains, particularly—

(*α*) The *Dome* (Ger. *Kuppe*; Fr. *Dome*), an elevation of small area, but rising with a steep angle to a depth more than 200 metres from the surface.

(*β*) The *Bank* (Ger. *Bank*; Fr. *Banc*) rising to within 200 metres of the surface, but not so far as within 11 metres (*e.g.* the Porcupine Bank, or Princesse Alice Bank).

(*γ*) The *Shoal* (Ger. *Grund*; Fr. *Haut fond*) and *Reef* (Ger. *Riff*; Fr. *Récif*), which come within 11 metres of the surface, and so are dangerous to shipping (*e.g.* Paracels Reef, Adler Shoal).

2. **Depressions**:

(*a*) The *Caldron* (Ger. *Kessel*; Fr. *Caldeira*), a more or less steep depression of relatively small extent (*e.g.* the Monaco Caldron on the Azores Plateau).

(*b*) The *Furrow* (Ger. *Furche*; Fr. *Sillon*), a valley or channel-like hollow in the continental border, and more or less at right angles to it (*e.g.* the Indus Furrow, the Ganges Furrow).

The opinion of geographers as to the appropriateness of this terminology, or as to the best synonyms of the German terms is asked for.

MAP OF SOUTH-WEST CHINA, TO ACCOMPANY CAPTAIN RYDER'S PAPER.*

The map of South-West China and parts of adjacent countries, which appears in the present number (p. 236), is intended to accompany the paper by Captain C. H. D. Ryder, R.E., read before the Society on November 24 last, and published in the February number of the *Geographical Journal* for this year. It has been reduced from thirty-four sheets of the North-Eastern and South-Eastern Frontier surveys, on the scale of 4 miles to an inch, now being published under the direction of the Surveyor-General of India, through whose kindness the Society has been furnished with advance copies. These sheets have been drawn from the recent surveys of Captain C. H. D. Ryder, R.E., Major H. R. Davies, OXFORD L.I., Captain W. A. Watts Jones, R.E., Captain L. D. Fraser, R.A., Major T. F. B. Renny-Tailyour, R.E., and other officers of the Indian Survey, supplemented in parts from the route surveys of the late Captain W. J. Gill, R.E., Mr. C. Baber, the Pandit "A. K.," Prince Henry of Orleans, Dr. Logan Jock, and other travellers. No attempt has been made to show boundaries, except where they have been definitely fixed.

In the spelling of the place-names care has been taken to follow as far as possible the special rules for Chinese names laid down by this Society.

THE GERMAN ANTARCTIC EXPEDITION.

The official report of Dr. von Drygalski has been received in Berlin, and was printed on July 10 as a supplement to the *Reichsanzeiger*. It begins with the departure from Kerguelen on January 31, 1902, and describes the voyage *viâ* Heard island (where a landing was effected, and a study made of the glaciers, animal life, etc.) to the position in which Termination Land had been thought by Wilkes to exist, though the voyage of the *Challenger* had thrown some doubt on the subject. The voyage was not made without difficulties; the pack-ice, which was reached on February 13 in 61° 58′ S., 95° 8′ E., for a time preventing any great progress in a southerly direction. Dr. von Drygalski is of opinion that the belief of the existence of Termination Land originated in the deceptive appearance of the icebergs, of which many were seen in the neighbourhood by the German explorers. Although the soundings showed smaller depths than had been met with previously, they were still too great to allow of the supposition that land was close, though from the nature of the icebergs it is thought probable that it existed at no very great distance. On February 18 a more rapid advance began, and on the 21st a previously unknown land was sighted. After describing the course of the navigation during February 18–20, Dr. von Drygalski proceeds as follows:†—

On February 21, at about 3.30 a.m., the announcement of land was made. After passing between many table-topped bergs, we found ourselves in front of a coast entirely covered with ice, evidently the termination of an inland ice-sheet. The ice rises at first steeply and then more gently towards the south, and appears to cover a hilly land. Approaching the edge of the inland ice, we sounded, at a distance of 2½ miles, a depth of 219 fathoms. We then sailed westwards, taking magnetic observations and dredging. On the morning of the 22nd we found ourselves enclosed by heavy ice-blocks, in which we remained imprisoned till February 8, 1903.

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* See *Geographical Journal*, February, 1903. This map may be inserted either in the present volume, or at p. 220 of the *Journal* for February, 1903.

† What follows is a condensed translation of the original report.

Snow continued to fall with some intervals until February 25, when it was first possible to look around. The inland ice lay far to the south, and open water was seen in various directions, a wide lead being only half a mile distant. Attempts were made to release the ship, but it was embedded fast in blocks 16 to 20 feet thick and more, and when the snowstorm ceased, the temperature fell in the night to 14° Fahr., so that the mass of ice and snow was firmly frozen together. On March 1, the international term day, magnetic observations were made by Dr. Bidlingmaier in a hastily erected ice-house on a floe.

The winter station of the *Gauss* was, then, situated in pack-ice, and not close to the land. At first some doubts were entertained with regard to the branches of our work which demand a stable position for satisfactory execution; but these were soon allayed by the discovery that the mass of ice was perfectly firm, and remained so until January 30, 1903, that is, a few days before our release. Sometimes small variations were at first observed in the levels of the astronomical and magnetic instruments, and these recurred during the violent storms of winter. A slight rotation seems to have occurred of the whole mass of ice, which was afterwards fully determined; but in the course of the year it never amounted to more than half a degree, and continued slowly and steadily in the same direction. Otherwise the mass was as stable as land, and afforded the same conditions for scientific work, so that even pendulum observations could be carried out. The situation was more convenient for free movement than a land station, and the close connection with the sea which could be established at the ship itself or through the floe ice had advantages for the biological work, and indeed also for the magnetic and meteorological, which a station on land could not have afforded.

The great stability of the station was due to the formation of the sea-bottom above which it lay, and, secondly, to the easterly winds which prevailed almost to the exclusion of those from other quarters. The sea-bottom, 160 to 220 fathoms deep, ascended gently southwards to 100 fathoms at the edge of the inland ice 50 miles away, and was studded with banks on which icebergs were stranded. Such a bank, at a depth of 65 fathoms, lay to the west of the *Gauss*, and was covered with a number of stranded bergs which stretched in a continuous chain nearly 8 miles northwards, and then bent round sharply to the east, forming a bay in which we lay. Against this bank the pack-ice around the *Gauss* was driven by the easterly winds and storms and there stopped, so that till January 30, 1903, the currents running to and fro in the sea could effect no alteration. We had, moreover, a few miles south of us a compact ice-pack, which must have lain there more than a year, and some 19 miles further to the south still older packs with numerous groups of icebergs which had been a long time stationary. These and various other circumstances combined to give to our position that fixity it maintained throughout the year, though all the time there were leads in the ice 4 miles east of the *Gauss*, with floes drifting along them. The heavy and continuous snowstorms filled up the crevices between the blocks and fragments of icebergs, rendering them more easy to traverse. The whole complex lay in a great bay, the east coast of which was formed by the lofty inland ice we sighted on the morning of February 21, while on the coast it was bordered by a long tongue of floating ice, which I shall have to refer to again, and will call the West Ice. I have called the newly discovered coast of the Antarctic land Kaiser William II. coast, and the great bay in which we lay Posadovski bay; while the bare volcanic peak which we found at its southern edge, at a height of 1200 feet, received the name of Gaussberg.

The installations of our scientific station were as follows: (1) Two magnetic observatories, of which one was set apart for the photographically registering variation apparatus, while the other served for absolute magnetic measurements. These were at first erected on a great floe about 350 yards south-west of the *Gauss*, and were built of ice-blocks, the first receiving a lining impervious to light. In the middle of June a removal became necessary, because the increasing snow-drifts pressed with exceptional force against these houses, and weighed down the floe more and more, so that the variation house was knee-deep in water. They were accordingly built anew in a small iceberg 250 yards south-south-east from the *Gauss*, and were kept in regular working order till January 30, 1903. (2) The meteorological station with all its accessories was erected about 40 yards south-south-east of the *Gauss*, but on January 10 was removed to another site east-north-east of the ship, as the hut in the first situation had melted away, and its position had become less accessible. (3) An astronomical observation hut of wood, erected for meridian observations, and also serving as a gravity observatory, was set up 200 yards west of the *Gauss*, encircled by a double series of sights, which also surrounded all the other installations of the station for the purpose of determining their displacements. (4) Two holes in the ice at the bow and stern of the *Gauss*, with blocks and windlasses to raise and lower the nets for biological work. From the beginning of January a fissure was generally used for this purpose, which had been opened 600 yards south of the *Gauss*. (5) An arrangement for tidal observations at the bow of the *Gauss*, consisting of a scale fixed to the jib-boom, which rose and fell with the tide, beside a pointer connected with the bottom 210 fathoms below by a wire heavily weighted. Apparatus was also fixed fore and aft to determine the direction and strength of the currents. (6) Two apparatuses for the measurement of the temperatures of the ice and sea by a combination of the electric and ordinary thermometric methods. One of these was placed on an iceberg fully half a mile from the ship, and reached down to a depth of 100 feet below its flat surface, the other on an ice-block, and then on the drift that accumulated over it from the stern of the vessel eastwards. The latter experienced many changes; at first it reached down to 30 feet below the surface—that is, below sea-level. Its lower parts sank beyond recovery in consequence of an enormous increase in the drift caused by a snowstorm in the middle of July, 1902, and was then kept working for some time at depths down to sea-level until in December it was extended down to 100 feet below sea-level. The smithy, kennel, magazines, etc., had frequently to be moved owing to the snow and the sinking of the ice under its weight.

The distribution of the work underwent many changes from the original plan, for the long-continued heavy snowstorms in winter added to the labour. This was particularly the case with the meteorological service, in which it proved impossible to keep the registering apparatus for temperature and humidity in order at all regularly, so that in May, 1902, I introduced hourly observations. The ship's officers were enlisted as assistants, being able easily to arrange their own duties so as to leave free time for this purpose.

The life of the members of the expedition was determined to a great extent, if not altogether, by the climate, for nowhere else on Earth do extremes of good and bad meet so closely as in Antarctica. The fine weather of the summer months would be suddenly interrupted by snowstorms, which made it impossible to work, and almost to stay out-of-doors at all; but from the beginning of September to the end of April we could reckon on days generally clear and often fine, and make our plans accordingly. From the end of April to the end of August it was just the opposite. In these winter months one snowstorm followed closely on another, especially in May and August, choking up everything outside that was left unfinished, and burying the ship so that it had each time to be cleared again. In such weather all work outside the ship had to be left undone. The short rounds of the meteorological observers to record the hourly readings were very toilsome, especially with the lantern in the long dark winter, but the five men on whom it devolved always performed this duty with the same care. There were times, however, when it was quite impossible, and therefore for such cases special arrangements were made close to the ship for reading the thermometers. Those for recording ice-temperatures were deeply buried, and after the snowstorm had ceased were found again after a long search and set afresh. At these times the magnetic observatories had to be visited four times a day, and this Dr. Bildingmaier and his assistant L. Reuterskjöld did with self-denying devotion to duty, feeling their way along a cable. A cable was also laid to the astronomical hut, where the chronometers were compared once a day.

On March 29 three balloon ascents were made in fine clear weather by the leader of the expedition, the captain, and Dr. Philippi. From a height of 1600 feet a very instructive view over the surroundings and the position of the *Gauss* was obtained. The Gaussberg, discovered at the edge of the inland ice on the first sledge-journey that had been meanwhile accomplished by Dr. Philippi, second officer Valhsel, and the seaman Johanesen, appeared as the only spot free of ice, as the only conspicuous point in the neighbourhood. Thence the edge of the inland ice could be traced eastward and westward, the rows and groups of icebergs running out from it, the sheets of pack-ice, and the direction of the leads in it. This survey, obtained at a height of 1600 feet, was a guide in many of our subsequent undertakings. During the first two months of our imprisonment small excursions were often made from the *Gauss* to study the ice, erect geodetic marks, explore the neighbourhood, photograph, collect specimens of rock transported by the ice, to kill seals and penguins, and as holiday trips for the men. The ice at that season, the autumn of the southern hemisphere, being too rough, dogs and sledges were not used. Dogs were taken by the men simply as companions, but they were so delighted with their freedom that they went off by themselves, leaving on their way the traces of their murderous proclivities, so that it was necessary, for the protection of the penguins, to restrict their freedom by leashes.

It was particularly delightful in these excursions to observe animal life in its original state quite uninfluenced by contact with human beings. We met with two species of penguin, the small Adelia penguin and the Emperor penguin. The former we noticed on our way through the pack, and for a short time in autumn (February to March) at the station before the ice had quite come to rest, and again from November onwards when it began to get loose again. The Emperor penguins were less common in the pack, increased in numbers southwards towards the fixed ice, and were our constant companions at the station throughout the year. Both showed the same unsuspiciousness of man, and only on our return voyage through the pack were they at all shy of us. They differed, however, decidedly in temperament. While the small penguins hurried towards us full of life and movement, croaking, almost snarling like angry dogs, and barring our way as if ready to attack us, though merely acting in absolute innocence of danger, and many got among the dogs and lost their lives, the larger penguins made off slowly with philosophical composure. They stopped before strange objects, making their presence known by trumpet-like tones or loud croaking, and only attempted to escape, if at all, when one stood close to them. Then they let themselves down on to the ice, and skimmed over it quickly, using their feet for propulsion, and steering with their wings. We noticed the small penguins only in small groups, while the larger ones passed by the ship in spring and autumn in flocks numbering as many as two hundred. We found especial pleasure in watching them in the leads, whence they would spring up on to the ice, and there continue on their way in a swimming posture. The spectator had need to take care that the birds, some of them as much as 75 lbs. in weight, did not strike him in springing out of the water.

The larger penguins were very useful to us as food, especially for the dogs. These consumed for some time three penguins a day. The skins and fat were burned, and so saved our fuel. The consumption of the expedition amounted in all to more than 500 penguins. Others fell a prey to our dogs.

We had seals—Weddell's seal—with us from October, 1902, in large numbers, and during our voyage through the pack saw leopard seals, chiefly at the outer edge, and further in towards the stationary pack the crab-eating seal—a distribution also confirmed on the home voyage. Seals were scarce in winter near the station. They were easily caught when they rested on the ice, and only raised their heads to stare with their large eyes at the approaching enemy, then calmly lying down again. In October they began to bring forth their young, and were then seen assembled on the ice with their young ones, though never in such large flocks as in the northern regions. The seals, too, were of great service to us. Their flesh, and especially the liver, was liked by every one, and was preferred to that of penguins, so that after October the latter almost ceased to appear on our table. The fat yielded good oil for illumination, and the skins were often used as clothing. Altogether we perhaps consumed 150 seals.

I shall not enter into details about the other forms of animal life, which were the special study of Prof. E. Vanhöffen. The bold and pugnacious skua gulls were constantly with us in autumn and spring; to hunt the greedy giant petrel, when it was too satiated with food to fly and could only run away, was a favourite sport. Of the characteristic petrels of the southern polar sea, the snowy petrel, in particular, wheeled round us in flocks with their rapid active flight at their nesting-place, the Gaussberg, while the other, *Thalassœca antarctica*, appeared there and near the ship in small groups. The small Wilson's petrel was common in the summer, and single specimens of the Cape pigeon were seen. Of the sea-fauna, besides seals, a species of Nototenia attracted general notice because it was so common in January and February, and was caught in bow-nets, so that we had very tasty meals; while another species of fish, a Lycodes, was only caught once, though its flavour, somewhat like that of eel, made the members of the expedition long for more.

The interval from the beginning of May to the beginning of September, the period of winter storms, and consequently of indoor occupation, may be considered the second period of our imprisonment. Our third sledge journey took place partly within its limits, and therefore was made under the least favourable circumstances. When we returned to the *Gauss* we found her prepared for the winter. A very important event during our absence before the middle of May was the discovery and repair of the leak. It was in the rudder well, and was discovered by sawdust thrown into the water. Then followed attempts to establish electric lighting. We had with us a small windmill, which, in connection with our accumulator, would maintain sixteen electric lamps. It was set up, and on July 3 the electric light for the first time illuminated the ship to general satisfaction. The wind, however, failed, and at the end of August oil lighting was introduced, every one being furnished with a lamp. These lamps were of great service to us, and were used up to the time we left the ice in April, 1903.

Speaking of work outside the station, I may refer to a number of soundings taken by Captain Rufer during short sledge excursions of a day's duration, which gave us an insight into the configuration of the surrounding sea-floor. The short intervals of fine weather were also taken advantage of for the collection of rock specimens on icebergs, study of the icebergs themselves, for photographic surveys, etc. I may also mention the formation of a depôt, first on a floe, and then on an iceberg 2½ miles distant, as a precaution in case of ice-pressure and a consequent mishap to the *Gauss*. Otherwise our occupations were conducted indoors. We did not suffer from cold in the ship. The steam-heating apparatus was never brought into use, stoves burning anthracite being found sufficient. Social meetings were most successful during the winter storms—celebrations, lectures, discussions, music, games—in which officers, staff, and crew took part. The excellent state of health that prevailed among the members of the expedition contributed greatly to this result.

The third period of our life at the station gave us opportunities for longer sledge excursions. It began in September and ended at the beginning of December. The excursions involved the prolonged absence of several members of the expedition—eight at most. But no interruption was caused in the regular course of work at the station. Almost every day, except when there were snowstorms—and these became less frequent, though they did not cease altogether—individual members or parties made short excursions. Dr. Gazert and I spent these in measuring and examining the icebergs and floes in the neighbourhood, Dr. Gazert taking valuable photographs. Prof. Vanhöffen observed the seals, which appeared on the ice in greater numbers from October onwards, tending their young, and also the bird life, which increased in number and variety as the winter storms abated. Dr. Philippi collected the erratic rock detritus on the icebergs, and took some valuable photographs. Captain Rufer executed additional soundings, and other officers measured the thickness of the ice, and noted the changes in its position, and the opening out of fissures and leads. Movements occurred in the ice 4 miles east of the *Gauss*, and there were leads in it all through the winter, and 600 yards to the west a fissure had existed from the beginning of September. Otherwise the condition of the ice, except for trifling variations, remained the same till we were released on January 30, 1903. The light in spring was very good for photographic work, and Dr. Vanhöffen, Dr. Gazert, and Dr. Philippi obtained 308, 386, and 830 photographs respectively.

The fourth and last period of our stay at the station extended from the beginning of December, 1902, to February 8, 1903. The condition of the ice prevented us from going far from the ship, not so much because the ice was dangerous, as that its surface had become so disintegrated that one sank deep into it at every step. Then snow-shoes were brought out, especially the Norwegian *ski*. Sledging was continued for a time, the team being increased from seven to nine or eleven dogs, and short excursions were made till the ice began to break up on January 30. In December, pools were formed in the hollows between the snow-drifts and the inequalities of the ice, and here and there holes were sunk by melting right down to the water. In January they froze over, though thawing still proceeded below. Through these connections with the sea, seals appeared in all parts of the ice, and not only at the well-known fissures, so that our sportsmen found plenty of game close to the *Gauss*.

The work of the station was carried on without interruption till January 30, and was then stopped because the icebergs in the immediate neighbourhood began to move. At this time the vessel was set in order ready for our departure, and works were started for the purpose of helping the ship out of its berth. A path of rubbish 10 or 12 yards broad was laid from the bow of the *Gauss* east and west over the ice in order to promote the thawing. It was 1¼ mile long, and ended on the east at a field of level ice where, as we perceived on our imprisonment, there was a frozen-over lead, and therefore an opening might be looked for; to the west it ended at a fissure which was formed at the beginning of September, and had gradually spread to 2 or 3 yards at the end of December. Ashes and refuse had been collected since June. At first much doubt was entertained as to its usefulness, but afterwards all agreed that the result was most satisfactory, and regretted that more had not been collected. However, enough refuse was dug out of the snowdrifts on the west side of the vessel to finish the path. Two to four men were constantly at work at it from the beginning of December. The effect was striking. The ice beneath melted away rapidly, and in January a steep-sided trench 6 feet deep was formed in the pack-ice, which was in parts filled with water and could float canoes. In some spots the whole mass was broken through, and seals and blocks of ice came up. In January the channel froze over, but the ice continued to melt beneath, and, at any rate, a line of small resistance had been formed, where finally the ice broke and we escaped. Still, this work was insufficient, for the pack-ice lay quite immovable, and only slight changes were observed at its outer border towards the east. As January drew to a close, the opinion spread that it would not break up at all, and indeed, considering the prevalence of easterly winds, could not break up.

We therefore began to dig out the *Gauss*, and first on the west side; but it proved an impossible task, as the drifts were fully 35 feet deep, and our work was rendered useless by a snowstorm. Then the east side was attacked, and from January 26 to February 7 the whole crew and officers worked hard, digging, sawing, and blasting, and excavated a hole by the middle of the ship 21 yards long and 6 broad. Ice 18 feet thick on an average had to be removed, and therefore the mass excavated amounted to about 1240 cubic feet. It was a great feat, but little in comparison to what must be accomplished if we were to get free. Calculate how we might, and taking into account all circumstances that might lighten the labour and accelerate the progress of the work, we could not estimate its duration at less than a year.

On February 8, 1903, we were relieved from our toil and set free. The increased power of the currents at full and new moon had, on January 30, enabled the icebergs around us to move northwards through the loose pack and to break it up. On February 2 we ourselves began to drift amid a pack 2½ miles long by 1¼ broad, which had separated in the west along the before-mentioned lead. We drifted with this pack a little to the east, a little to the north, and then back again among the icebergs we knew so well, some of which we knew to be stranded. The pack seemed unable to break its bounds. We had, however, frequently noticed movements of the ice within our pack caused by swells. On the morning of February 8 these were stronger than ever; sea-water forced its way through the fissures into our artificial channel and fell back again. The ice groaned and bent; it could not withstand this force. About midday an east wind again arose and threatened to drive us westward against the bank of icebergs and once more imprison us, but at about a quarter past three two short shocks were experienced, and we knew that the ice had broken. The dogs were quickly got on board, while the meteorological station and all the apparatus which still remained in the ice was packed up. By five o'clock the rift had so widened that the people on the ice had to be taken on board by means of ropes. The machinery was free, and at 7 p.m. (February 8,

1903) we left our winter quarters amid three hearty cheers, steaming along the lead which had opened towards the west, until, turning northward, we rounded the end of the bank of fixed bergs which had so long held us, and proceeded on our voyage.

Before describing the further course of the expedition, I propose to give a synopsis of the sledge-journeys undertaken from the *Gauss*. These were as follows :—

1. *March* 18-26, 1902.—Dr. Philippi, second officer Vahsel, and one seaman. Two sledges. Ascent of the Gaussberg. Photographs taken and geological specimens collected.

2. *April* 4-16, 1902.—Dr. Philippi, first officer Lerche, and seamen. Four sledges. Geological research on Gaussberg. Photographs taken. Ice-hut built at foot of mountain. Meteorological instruments set up there.

3. *April* 22 *to* May 15, 1902.—Prof. von Drygalski, Prof. Vanhöffen, Dr. Gazert, second officer Ott, and seamen. Four sledges. System of marks fixed and measured up on the land-ice near Gaussberg. Fishing, sounding, and dredging in the sea near the Gaussberg, and the edge of the land-ice. Meteorological and astronomical observations; zoological, botanical, and geological specimens collected. Photographs.

4. *September* 16 *to October* 14, 1902.—Prof. von Drygalski, Prof. Vanhöffen, Dr. Gazert, Dr. Bidlingmaier, second officer Vahsel, and seamen. Four sledges. Westerly route to Gaussberg. Further measuring of mark-system on land-ice. Supplementary measurement of Gaussberg. Photogrammetric work. Fishing, dredging, sounding. Supplementary astronomical observations, meteorological and magnetic observations, and photographic register of magnetic variations. Photographs. Record left in cairn on north-west declivity.

5. *October* 26 *to November* 5, 1902.—Dr. Philippi, first officer Lerche, and seamen. Two sledges. South-westerly route to ascertain trend of the edge of the land-ice westerly towards Gaussberg. Discovery of an ice-mass (West Ice) striking south to north; eastern edge followed south to neighbourhood of Gaussberg, and back to neighbourhood of its northern end.

6. *November* 18-24, 1902.—Dr. Bidlingmaier, Captain Rufer, second officer Ott, one seaman. Two sledges. Magnetic measurements west of winter station. Position of northern end of west ice ascertained. Soundings.

7. *December* 1-4, 1902.—Prof. von Drygalski, Dr. Gazert, Dr. Philippi, Captain Rufer, and seaman. Two sledges. West ice followed up to its northern end. Soundings.

Fifty-seven days were occupied by Prof. von Drygalski and Dr. Gazert in sledge expeditions, fifty-three by Dr. Vanhöffen, and lesser periods by other principals in the expedition.

It will appear from the foregoing table that the third and fourth journeys, made at a time when the winter storms were at hand, were protracted beyond the rest. The value of sledge journeys is manifest. New points of interest were discovered with regard to the continental relations of the south polar land-ice, an exact realization of south polar conditions from our position, etc. When I add that these journeys furnished an antidote to the unavoidable solitude of a sojourn in polar regions, it will be understood how much I appreciate the excellent equipment of our dog-teams, without which these journeys could not have been prosecuted. The land might have been reached without them, but lengthy journeys would have been impossible. Seven to nine dogs were used to each sledge; with seven, a burden of 670 lbs. could be dragged over difficult ice. The dogs were harnessed by pairs, with a leader in front. Where no track was obvious, one of us led the way. We lived and slept in tents and sleeping-bags, which afforded sufficient protection from cold as severe as − 30° C. (− 22° Fahr.). Cooking was done with petroleum or naphtha; on the fourth journey we lost our fuel and had recourse to seal-blubber, and were forced to kill seals for use as food for men and dogs. The eight inmates of a tent were once confined to it for forty hours by a snowstorm.

On being freed from our winter quarters on February 8, 1903, our object was to investigate the coast region to the west. When we had passed the northern end of the ice-barrier, which had obstructed us so long, on the evening of February 8, we took a course, not easterly or north-easterly (which at first appeared the most direct), but northerly, with the intention of diverging to west when possible. My orders to the captain were to keep the best available course between north and west. Meanwhile, a gale which had sprung up at the moment of our release developed into a regular snowstorm, and on February 9 we were again beset in pack-ice. When it cleared, we found ourselves at the north-eastern end of the west ice. The time from now to March 16 was occupied in breaking a way through the pack with the engines, the captain taking every opportunity of progressing, first north-westerly, then more to the north and north-north-east through drift-ice. Sounding and other hydrographic work, with magnetic observations on the pack and on board, occupied us now, and afforded interesting results. A marked difference of climate was observed in comparison with the station we had occupied only a little further south. We had had easterly winds there, but west winds now reached us, and the weather was relatively warmer.

Our course had been along the northern edge of the west ice. On February 19 we lost it in 65° 32′ S., 87° 40′ E. (from Greenwich), having already passed the boundary between the shallow and the deep sea on February 16 in 65° 45′ S., 87° 57′ E. On that day we had soundings at 3 a.m. in 371 metres (203 fathoms); 10 a.m., 1103 metres (603 fathoms); 8 p.m., 1611 metres (880 fathoms). Here, then, there is a rapid fall from the Antarctic shelf.

Till February 20 we followed fairly long channels, covered already with young ice, in a westerly direction. After this channels through the pack were few, and progress was slow. On February 21 we met with an iceberg which we had previously marked; it demonstrated a westerly and somewhat northerly drift. The character of the pack was changing, and we were subjected to some wrenching and squeezing from the blocks. An increasing swell, moreover, hindered and finally prevented astronomical work on the pack. The ship behaved in every way satisfactorily, withstanding the ice and boring through it effectively. Our best screw, however, was broken off against an ice-block. The ice-*débris*, resulting from the collision of the floes, formed our most serious hindrance by stopping the momentum of the ship.

The time was now at hand when, a year previously, we had lain up in the ice. We were drifting northward, and were leaving the ice for clear water, and the question was, what next? The possibility that the ship would be overtaken by winter storms in loose pack-ice without a firm position opened up the possibility of dangers, and of having to remain under steam. For this our coal-supply would be insufficient. These and other reasons led some to advise our departure from the south polar regions.

In spite of this, I decided upon a further attempt southward. Our expected release took place on March 16, 1903, the pack being loosened, and we proceeded under steam. We steered at first north (March 14), then west (March 15), and reached the outer edge on the 16th, in 63° 52′ S., 83° 19′ E. The outer edge lay over 1° north of the position determined in February, 1874, by the *Challenger*. We followed the edge (seeing a few icebergs) at first west, then (March 17, afternoon) south, with an open sea before us. The water-temperature was remarkably high. The dark grey albatross (*Phoebetria fuliginosa*) and other birds accompanied us, and suggested by their presence the existence of an ice-free sea to the south. On the evening of March 18, however, we were stopped by an ice-barrier. Next day came a storm from the west, and we ascertained that the open water was closing in. On March 20 we continued, first west, then south, progressing, with checks, through channels and leads till March 26. Scientific work occupied us during these checks.

It soon became clear that where we were, surrounded by icebergs (190 were counted in a day from the crow's nest), the sole protection to be derived from the firm freezing of the whole could not be counted upon. To proceed south was impossible, for the new ice could not be broken, and on all counts the position of the ship would be hazardous; the coal, moreover, would not last long enough. I gave the order to turn on April 8 about midday, and it was carried out in 64° 58′ S., and 79° 33′ E. It may be safely asserted that we should have been in the same predicament at only a few minutes of latitude north of our winter quarters. This shows once more how nearly extremes meet in the south polar region. The influence of the wide girdle of ocean with its westerly storms and heavy swells extends across two degrees of heavy pack-ice to the near neighbourhood of the fixed inland ice amid the shallows of the continental shelf, keeping the ice in a constant state of unrest. The steady ice-conditions which we had at our winter quarters, and to which alone we owed the possibility of carrying out our scientific observations there in their entirety, depended principally on the easterly storms, together with the climatic influences of the inland ice and stranded icebergs. Such conditions would probably be constantly repeated at the spot in question, and might even last throughout the year, as there are shoals on which some, at least, of the bergs that break from the edge of the inland ice must be stranded.

On April 9 we got clear of the ice. The storm-tossed blocks through which we passed made a magnificent picture. The boundary of the pack-ice east of us trended northward, so that till the evening of April 10 the ice-blink was visible. We struck single blocks of ice on the 10th. To west we saw no sign of pack-ice. The sea-temperature on leaving the ice in 64° 38′ S. and 79° 47′ E., as usual, rose rapidly. Magnetic and oceanographic work was done on the way home, but the deep-sea dredge could not be used owing to stormy weather. On April 13, in 59° 54′ S., 70° 22′ E., the last iceberg was passed. Kerguelen island was passed on the 19th, St. Paul on the 26th, New Amsterdam on the 27th. Between April 30 and May 3 we passed from the roaring forties into the calms, and entered the trades on May 3. On May 11 two ships were seen, and the second was spoken and a message sent to the German consul at Delagoa bay. Port Natal was reached on May 31, and on June 9 the harbour of Simons-town, in False bay.

REVIEWS.

EUROPE.

North-West Europe.

Stanford's 'Compendium of Geography: Europe.' Vol. ii. Edited by G. G. Chisholm. London: Stanford. 1902.

In the new issue of this series, the second volume of *Europe* is devoted largely to an elaborate treatment of the British Isles. The whole volume (without reckoning index) contains 720 pages: of these 580 are occupied with England, Scotland,

and Ireland. The treatment is throughout interesting, vigorous, thoughtful, and minute; but is somewhat out of proportion to the rest of Europe. In particular, chapters xi–xiv., on Early Inhabitants of Britain, on Roman Britain, on The Teutonic Settlements in Britain, on The Effects of the Teutonic Settlements, on The Norman Conquest and its Results, though each and all of high excellence in themselves, are of a character very different from what is anywhere to be found under the other lands of our continent. Elsewhere the historical details given are mostly incidental to the description of the towns. The minuteness, also, with which the past conditions and phases of British trade are reviewed, and contrasted with the present, is quite unlike what we find in the treatment of other European regions in this series. Thus chapters xvi.–xxii., on The Population of England—Domesday to 1800,—and on English Agriculture, Mining and Smelting, Manufactures, Foreign Commerce and Shipping, and Political Situation during the same period, from the eleventh century to the close of the eighteenth, together with the elaborate survey of England in the Nineteenth Century, may be called unique in this series. Nothing really parallel to it is even attempted elsewhere; nor could it have been without swelling the Compendium to unwieldy size. Very high praise must at the same time be given to much of the matter in these portions of Mr. Chisholm's work: one only wishes, at times, that he would quote less and give his opinions more; for (as on pp. 274, 275, in his discussion of English population under William the Conqueror) these opinions are admirably sane and avoid the falsehood of extremes very happily. In the account of Ireland sufficient direct attention does not seem to be given to the American emigration of the Irish race, and to the steady drain upon the prosperity of the Green Isle which this involves, causing, in spite of every measure to the contrary, a continuous and still existent decline in the population of the country as a whole, and an unarrested decay in many of its industries. Unstinted praise must be given to the care and zeal with which Mr. Chisholm has undertaken what is really a separate treatise, involving a great mass of work, upon his own country; and especial value attaches to the statistical parts of this treatise. C. R. B.

History of Falmouth.

'Old Falmouth. The Story of the Town from the Days of the Killigrews to the Earliest Part of the Nineteenth Century.' By Susan E. Gay. London: Headley Brothers. 1903.

The title sufficiently explains the scope of this book, which contains a large mass of interesting information on the fortunes of Falmouth through the most stirring days of its history. Although lacking the antiquity of some of our more famous towns, the story of Falmouth has a charm of its own, and supplies an interesting object-lesson of the vicissitudes brought about by the changing conditions of different times. The early history of the site centres in the Manor of Arwenack, which came into the hands of the Killigrew family (previously landholders elsewhere in Cornwall) through the marriage of Simon Killigrew to a daughter of the Lord of Arwenack towards the end of the fourteenth century. It was through the efforts of a later member of the family, who had entertained Sir Walter Raleigh in his castle on his return from Guiana, and found in him a cordial supporter of his proposal to utilize the great natural advantages of the site, that the permission of King James I. for the development of the town was obtained. But the palmy days of the place were those of the Postal Packet Service, of the stirring history of which, and the daring exploits of the captains engaged in it, Miss Gay has much to tell. The modern decline of the place as a port of call (though its graving docks offer unusual facilities for repairs to the largest vessels) has been due to the advent of steam-navigation, which encouraged the great liners to make use of the short cut across the bay to Plymouth. The future prospects of the place lie in its development as a health-resort, in which respect it possesses many of the advantages of the more fashionable resorts further afield. But Miss Gay makes a well-justified protest against the prospective ruining of its natural beauties by the vandalism of the modern builder.

Some notes are given on the earliest maps of Falmouth, one of which, drawn in the reign of Henry VIII., is reproduced in facsimile. There are also many illustrations of the old architectural objects of the place, and portraits of its most distinguished worthies, including members of the old quaker family of Fox.

ASIA.

SIBERIA.

'Greater Russia.' By Wirt. Gerrare. London: Heinemann, 1902.

This is a new book, and a useful one, added to the now considerable library of modern works on Siberia, the Amur, and Manchuria. The style is, it must be confessed, rather flat and stale, but the matter is not unprofitable. The arrangement of the narrative, and of the author's remarks and discussions, is sometimes wanting in clearness, in logical precision, and in that brevity which is the soul of wit: there are occasional repetitions of a needless character. But a mass of detail is given us which is obviously—and professedly—from first-hand observation, which is often very interesting and suggestive, and which receives great assistance from a series of excellent illustrations. The chief addition Mr. Gerrare makes to previous Western knowledge is in his account of a new Russian railway in Mongolia. This branches off from the main Siberian-Manchurian line about 70 miles west of Khailar and about 650 miles north of Pekin, and thence drops down southward towards Kalgan and the Great Wall of China along the western slopes of the Greater Khingan range, running almost due south at first, south-south-west later. It skirts the eastern side of Dalai-Nor and Buin-Nor lakes, and is intended (according to the information collected by the author while travelling in disguise through Manchuria) to follow the old Mongol trade-route from the Khalkha river to Dolon-Nor and Kalgan. It is a substitute for the Kiakhta-Kalgan railway scheme —across the Gobi desert—and is said to have been suggested to the Russian authorities, partly by their own travellers and surveyors, partly by Scandinavian missionaries flying before the "Boxers" and taking refuge within the Russian lines. Only a small part of the new branch was finished when Mr. Gerrare passed along the trunk line to the north, but if it has been pressed forward with the same speed as the other parts of railway construction in Russian Asia, it may well by this time have reached within measurable distance of Kalgan. If so, its importance will be obvious: strategically, it would clearly be, when completed, the most important part of the whole Siberian system.

In Greater Russia, the author, while criticizing freely and sharply, speaks on the whole with well-balanced approval of recent developments. Certainly there has been a marked improvement since the old *régime*, the time of Nicolas I., or even that of Alexander II.; and the improvement has affected both sides of the Urals, though not equally. "There has been a great awakening of Russia. The people, debarred generally from active participation in politics, have directed their energies towards the commercial and industrial exploitation of their native land." In particular, "the Siberia opened by the railway is a land of much promise," and especially promising are the newer settlements along the line, neat railway buildings, immigration homes, schools, churches, mills, stores, substantial and commodious dwellings of all sorts, typical of the free colonies which the Russian Government has of late been planting so assiduously. In the exact phrase used by J. Y. Simpson, in his 'Side Lights on Siberia,' Mr. Gerrare concludes that Russia seems to be "developing faster than any other European nation," and notes the Russian passion for the most recent American inventions, co-existing, however, with an extreme backwardness and a blind conservatism in many parts and on many sides of life, and especially of agricultural life. C. R. B.

AFRICA.

TRIPOLI.

'A travers la Tripolitaine.' Par H. M. de Mathuisieulx. Paris: Hachette. 1903.

The modern literature on Tripoli is so scanty that even this unpretentious little work, written by a traveller who was accorded unusual facilities for penetrating the interior, is a welcome addition to our knowledge of that country, although the preface by M. Bertrand perhaps exaggerates somewhat the general inaccessibility of the vilayet to Europeans. Much as the authorities are averse to permitting the free passage of travellers beyond the walls of the capital, more than one recent traveller has succeeded in gaining some first-hand knowledge of the country, which towards the middle of the nineteenth century was still more accessible to the outside world. The early chapters of the book give a graphic description of the city of Tripoli, its antiquities, its motley inhabitants, and its relations with the far south by the caravan-route across the Sahara; but more novelty is perhaps presented by the account of the author's two circular tours in the interior, in the course of which he visited the Gariana and Yiffren uplands to the west, and the plateau of Tarunha and the Msellata mountains to the east, of the centre line of the country. The whole of this mountainous zone falls steeply to the north in an escarpment broken by numerous wadis, while to the south it falls gradually, in accordance with the dip of the strata, to the stony deserts of the Hammada el Homra. As the northern outliers of this elevated zone show a reversed dip, the author suggests that the original line of the water-parting ran nearer to the sea, and has been pushed back by the effects of erosion. The scattered Berber population of the Tripolitan "Jebel" has lost all its old love of freedom, and the whole country is under the effective occupation of the Turks.

M. de Mathiusieulx draws a melancholy picture of the poverty and desolation of the country, and considers as a mere delusion the idea that—apart from Barka—any great amelioration of its agricultural capabilities is possible. He considers that the present state of things is due to the destruction of the forests, which, in his opinion, once covered the mountains, though it may be doubted whether the evidence is such as to justify this conclusion. He has much to say on the most interesting antiquarian remains which are scattered so thickly over much of the country, some of which he was able to bring to light for the first time. Various examples of these are to be found among the author's photographs, which also give a good idea of the general surface features of the country.

ADVENTURES IN BRITISH EAST AFRICA.

'An Ivory Trader in North Kenia.' By A. Arkell-Hardwick, F.R.G.S. London: Longmans. 1903.

Although largely concerned with sporting adventure, this book acquires a further interest from the fact that it deals with a country still beyond the outskirts of civilization, and to which but a few travellers had previously penetrated. The author belongs to the class of young and adventurous Englishmen who did so much in the early pioneering days to extend the bounds of geographical knowledge, though with the greater demands made on the traveller by modern scientific methods such journeys must now take a more or less subordinate place in the scale of merit. Without possessing the scientific training which would enable him to give a systematic account of the geography of the districts visited, he shows himself an observer of some acuteness, and had he lived some half-century earlier, he would probably have taken a high place among the adventurous spirits who rolled back the curtain of mystery which then covered the interior of Africa.

Mr. Hardwick, who had previously led a more or less wandering life, and had gained experience with the British South African Police in Mashonaland, went to East Africa in 1899, and in course of time joined two other Englishman, one a hunter of much experience, whom he names throughout "El Hakim," on an expedition to the north-east of Mount Kenya, along the course of the Gwaso or Waso Nyiro. It will be remembered that this stream was traced by Chanler almost to its supposed termination in the Lorian swamp. On reaching his furthest point, however, after many difficulties owing to the desert nature of the country, no trace of Lorian was visible, and though the Gwaso Nyiro was followed for some distance further, its end was not reached. Mr. Hardwick thinks that the swamp seen by Chanler must have been the highest of a series, most of which had since dried up owing to the three years' drought to which the country had been subject. He draws a striking picture of the desolation which characterized the region on this account; travelling over the loose brown soil, varied occasionally with lava-blocks, being excessively fatiguing to the traveller. The country produced a superabundance of rhinoceros, which caused constant alarms to the caravan, but apparently little else. Mr. Hardwick and his friends made the acquaintance of a section of the Rendile Gallas, who are still little known to geographers. He was agreeably impressed with their physique and cleanliness, as compared with the other races with which he had come in contact, and gained a more favourable impression of them generally than had been done by Chanler. The Burkeneji, another tribe met with on the Gwaso Nyiro, are more akin to the Masai, whose propensities they share to a great extent. The caravan eventually made the complete circuit of Kenya, thus passing through other little-known districts; and Mr. Hardwick's descriptions of the country are a considerable help to an understanding of its characteristic features.

THE MONTHLY RECORD.

EUROPE.

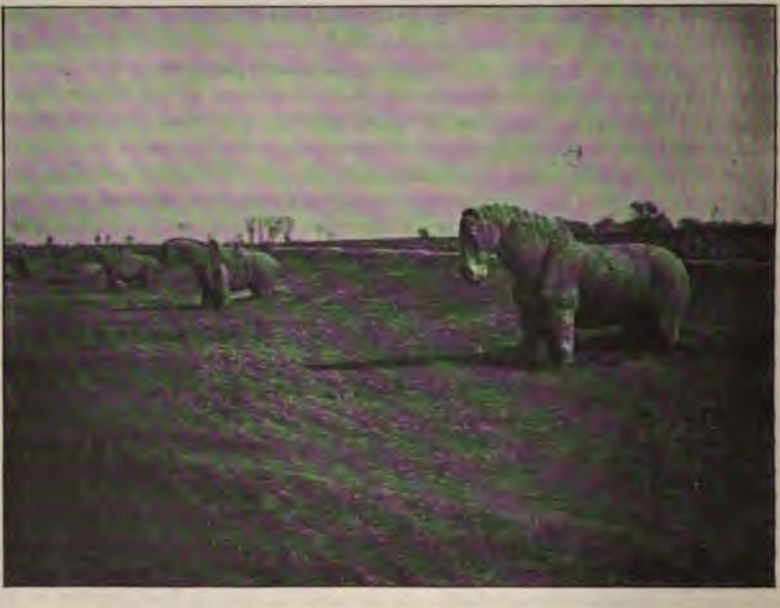
The Schilling-See in East Prussia.—Herr G. Braun of Königsberg, who is engaged in the preparation of an important work on the lakes of East Prussia, has lately carried out soundings of some of the lakes, as to whose contours little was previously known. He gives the results as regards the Schilling-See in the third number of *Petermanns Mitteilungen* for the present year. The lake lies on the elevated western part of the Prussian ridge known as the "Oberland," and originally belonged to the system of the Drewentz, but, like a whole series of the Prussian lakes, its hydrographical relations have been artificially modified by the making of the "Oberländische Canal." The lakes of this series may be divided according to their depths into two main groups lying east and west of each other. Those to the east are generally deep and markedly furrow-like, while the western lakes are shallow and round in outline. Still further east is another group not connected with the canal. The Schilling-See is one of the furrow-shaped group, of which it may be considered thoroughly typical. With others it lies on a line of depression, running somewhat west of north-west (the normal direction of the long narrow lakes of its class), the land-contours between the separate lakes continuing the valley-like form of the parts covered by water. The lakes of this class occupy troughs eroded by the glacial water beneath or in front of the ice-mass, while the wide shallow lakes are ground-moraine lakes. The land-contours drawn on Herr Braun's map bring out clearly the (at first sight) somewhat singular fact, which is explained, however, by the glacial history of the region, that the lake crosses at right angles the depression, little above sea-level, through which the Oberländische canal passes, both its north and south ends being bordered by comparatively high ground. One of the main deep basins—in fact, the most extensive of all—lies athwart the line of lower ground. This exceeds the depth of 100 feet for a length of over a mile. From a series of temperatures, taken by Herr Braun on August 22, 1902, the sudden fall of temperature takes place between 11 and 12 metres (36 and 39 feet). The surroundings of the lake are marked by seclusion and the general absence of human activity, timber being the only product calculated to call it forth. This clothes the steep shores of the northern end, while those to the south are in strong contrast from their bareness. Herr Braun gives some description also of the Narien-See, one of the group of ground-moraine lakes, former soundings of which were confirmed by his own work.

ASIA.

Investigations in Sistan.—Mr. G. P. Tate, of the Indian Survey department, whose previous work in the western borderlands of India is well known to our readers, sends us, under date May 30, 1903, an interesting account of investigations made in Sistan during the stay of the British boundary commission in that region. Owing to drought in Afghanistan, the lower Helmund, and with it the Hamun-i-Sistan, had quite dried up in the summer of 1902, causing all the fish, as well as the herds of wild pig and numbers of the water-fowl, to perish. The ruins of the old city called Shahr-i-Sabari, which are usually covered with water, were exposed to view. They consist of the foundations of houses, all constructed of baked brick, and covering a large area. Copper coins and other curios were obtained from them. Mr. Tate was able to study the floor of the lake, the configuration of which is of much interest. It consists of a series of shallow pan-like hollows, with low ridges between, but connected with each other by narrow channels. The ridges are covered with water in a normal season, but even then admit of the crossing of the Hamun by wading. Levels taken on the dry bed of the lake showed an upward inclination towards the west and south. The Helmund began to rise on March 1, and the lake had since been gradually filling, the water entering almost entirely by the Rud-i-Perian, which, as the Siksar branch will soon be quite abandoned, promises to become the main and only branch of the river. (For the various changes of the course of the Helmund, cf. Major Sykes's paper in vol. xix. p. 143.) When the Rud-i-Perian silts up, Mr. Tate thinks that the river will revert to its ancient bed under the cliffs of the Dasht-i-Marp and the district of Sar-o-Tar to the east. The Hamun fills up from the east and north, the water gradually spreading south into the Shela river and the Gaud-i-Zirreh, a circumstance which bears out the results of the levelling. At the end of April it was possible to ride across the Hamun, with practically no water on the way, but on the return on May

8, the crossing was effected on rafts of bulrushes, the camels wading. A current of 2½ miles an hour was then setting south. Both the Farah Rud and the Khash Rud (north and east of the Hamun) were also in flood, and helped to fill the depression. At the embouchure of the latter a large area is flooded around Chakansur, producing rich pasture after the floods have dried. It is called Ashkinak. This term (or "Ashkin") is generally applied to lands only temporarily flooded; "Chung" to water too deep for reeds to grow; "Naizar" to shallows and reed-beds; and "Hamun" to a large expanse free from reeds, such as the lake itself. Mr. Tate says that modern improvements and methods now in use in the Indian Irrigation Service, such as syphon bridges, were employed in olden times in Sistan. The heads of the distributing channels, etc., were of baked brick set in cement, and the old canals have masonry abutments, on which rested wooded bridges. Many interesting remains are to be met with in the Sar-o-Tar district, where are the sites of towns, fortresses, and villages which yield quantities of Sassanian, Parthian, and Scythian coins, as well as those of the Caliphate and later Mohammedan dynasties. Mr. Tate is making an archæological survey of the ancient towns and sites, illustrating these by photographs, which should prove of much interest. He hopes to continue his work during the present summer. We are also informed by Major H. F. Walters that, during the stay of the Commission in Sistan, the altitude of the Kuh-i-Khwaja was independently fixed by two of the officers, the result being to place it at 2037 feet above the sea, or 437 feet above the plain. This agrees well with Major Sykes's estimate of 400 feet.

Stone Figures in China.—Under date "Hsiaochang *viâ* Te Chou, Tientsin, North China, April 27, 1903," Dr. Sewell S. McFarlane sends the following communication: "In February, during one of my journeys in the south-west province of Chili, North China, I came across a number of stone horses, sheep, lions, etc., some in a fair state of preservation. They were in two parallel rows, and beside them were



STONE FIGURES IN CHINA.

several 'petrified' Buddhist priests, supposed to be on guard. The people seemed to know nothing about them, and cared less. Upon inquiry among the gentry of the adjoining village, one old gentleman informed me that it was the entrance to a very old subterranean tomb, of one of China's prime ministers who lived under the Han Dynasty. This would be about the year A.D. 25. Many years ago a tablet stood there, which they unearthed with the above stone figures, giving full particulars, but the disinterested inhabitants destroyed it, 'as it was in way of their cart track.' How the people came to unearth these huge statues is interesting. During the past generations, the severe dust-storms experienced in North China have swept over the district and steadily but effectually buried out of sight the beautiful tomb and all its accompaniments. The inhabitants frequently dig out their land to make mud bricks for their houses, and in this manner the stone figures came to light. It is said there are a great many more of them, ere one reaches the actual tomb. Had this been in England, these ancient curios would have been excavated and a correct description published centuries ago. But in China the country folk, who simply live from hand to mouth, somewhat take after Gallio, of sacred writ, and 'care for none of these things.' I enclose a snapshot of part of the excavated avenue, hoping it may be of interest to the readers of our good old *Journal*."

French Survey of the Upper Yangtse.—We announced, early last year, that Lieut. Hourst, previously known for his excellent work on the Niger, had ascended the Yangtse rapids in a gunboat with a view to carrying out a survey of the upper river. Since that time M. Hourst and his coadjutors have been actively employed in this work, and the results, which are summarized by M. Bons d'Anty in the May number of *La Géographie*, promise to be of much value for the navigation of the river and our exact knowledge of its upper basin, though a certain amount had already been done in this direction by the British officers in command of the gunboats which ascended the river two or three years ago. The precision of the river survey seems to have varied to a certain extent in different sections. Between Ichang and Chungking (395 nautical miles), and between Chungking and Swifu (230 nautical miles), a careful triangulation was carried out by means of the theodolite, the detail of the banks being filled in by the plane-table, while careful soundings were made, including three continuous lines in the upper section. Between Swifu and Ping-shan-hsien the survey was carried out by compass and plane-table, and above the latter a rapid examination of the stream was made as far as Shen-nin-tan, this section being quite impassable by steamers. Other surveys were carried out on the small river Kiangwo-ho, on the Min between Swifu and Kiating (with reconnaissance beyond Kiating to Kiang-kiu), and on the Fu-ho which joins the Yangtse at Fu-chou. The chief work remaining to be done was the examination of the Kialing-kiang, which joins the Yangtse at Chungking. It may be mentioned that the Yangtse was this spring ascended to Hankow by the *Glory*, the flagship of the British China squadron, this being the first battleship and the largest vessel that has yet reached that port.

AFRICA.

The Geological History of the Sahara.—Some two years ago, it will be remembered, considerable interest was aroused by communications from M. de Lapparent, urging the necessity for a revision of our ideas with regard to the geological history of the Sahara, in view of the evidence supplied by a fossil sea-urchin from Bilma, which he had had the good fortune to bring to light, that in Cretaceous times the sea must have covered the region around Lake Chad. Some hesitation was naturally felt in accepting without reserve a conclusion of such importance on the authority of a single fossil, which might conceivably have reached Bilma by the caravan route from Tripoli. But M. de Lapparent has used his influence to secure the collection of further evidence by some of the many French officers at work in the Central Sudan, and his efforts have already met with decided success. As related in the June number of *La Géographie* (in which journal, as well as in the *Comptes Rendus* of the Paris Academy of Sciences, the subject was originally broached), a further discovery of fossils has been made by Captain Gaden, an officer to whom the search for such evidence was suggested by Commandant Gourand, in the vicinity of the Anglo-French frontier to the north of Sokoto. At a place called Tamaske, some 250 miles west of Zinder, there is a horizontal bed of limestone, cut up by the *dallols*, or old river-beds, which characterize the region. In the side of one of these Captain Gaden found fossils, which he sent to M. de Lapparent. They proved to be a nautilus and four sea-urchins, the latter of which, when examined by M. Victor Gauthier, showed that the deposit was of marine origin and of the same age as the limestone of the Paris basin, which was laid down in the old "Lutetian" (Tertiary) sea. It is reported by Captain Gaden that similar fossils occur in the region extending from Zinder towards Air, and as the country between this and Lake Chad is quite level, M. de Lapparent justly concludes that the Lutetian sea reached the position of the lake, and probably of Bilma also. But this is not all, for sea-urchins, not absolutely identical, but of the same age, have recently been found near Dakar, and in spite of the considerable distance which intervenes, M. de Lapparent holds that an arm of the sea must have extended inland from the Atlantic to the Eastern Sahara. He points out, also, that the Indian affinities of the sea-urchin from Bilma, and the fact that those lately found at Tamaske belong to a genus known hitherto only from India and Egypt, point to an unbroken sea-communication between India and the Central Sahara by way of Egypt, in Cretaceous and Tertiary times. Northern Africa would then have consisted merely of two large islands, the one formed by the massifs of Air, the Tassili, Ahaggar, and Twat, the other (possibly a peninsula) by the Abyssinian highlands. M. de Lapparent has certainly shown that existing ideas as to the geological age of northern Africa as a whole must be seriously reconsidered.

Journey in the Western Sahara.—It is announced in the *Politique Coloniale* for July 20-21 that Colonel Laperrine, whose name is well known to geographers for his survey work in the Algerian Sahara, has made an important journey to the south from Timimun, pushing into the desert to a point some 250 miles from Twat, and nearly halfway between that district and Timbuktu. Over 500 miles of new routes are said to have been surveyed.

The Islands of Lake Chad.—Reference was made in the *Journal* for June of this year (p. 674) to the valuable work lately done in Lake Chad under the orders of Colonel Destenave. The map of the eastern part of the lake, which has been prepared by Captain Bézu from the observations of the various officers employed, is given in the June number of *La Géographie*, and brings out admirably the remarkable character of the eastern coast region. As already mentioned, the islands which fringe this coast run with great regularity from north-west to south-east, this being due to the currents and prevailing winds. Another point clearly brought out by the map is the great regularity in their distribution. Never does the mainland touch the open water throughout the whole eastern side of the lake, though the width of the zone of islands varies from about 5 to nearly 20 miles. The intervening channels show great uniformity in width, rarely much exceeding 2 miles, though in places they are much narrower. The map distinguishes by colours the low-lying islands and sandbanks from those occupied by forests or plantations. The actual shore of the lake is very ill defined, as it is much cut up into peninsulas which reproduce the trend of the islands. In a brief description of the work of the survey, Colonel Destenave gives some interesting details regarding the general hydrography of the lake. In the deep south-west basin its waters are yellowish, no doubt owing to the existence of banks of clay. In the region of the islands and in the extreme north they are often muddy, though much clearer around sandy islands. At the time of its annual rise the water is sweet and limpid, and only at low water (May and June) is it at all brackish. According to Captain Dubois, the numerous lagoons round its shores act, like the gulf of Karabogbaz in the Caspian, as purifying pans in which the greater part of the salts contained in the water is precipitated during the fall of the lake. High water occurs in December, the rise amounting to 1·20 m. (4 feet) only. There is likewise a general displacement of the water-covered area towards the west. From the Shari delta to the eastern corner of the lake, a distinct current runs along the south coast, and is known to the natives, like the depression which runs to the east from this neighbourhood, as the Bahr-el-Ghazal. At the time of the great rise noted by Nachtigal, there is said to have been also a water-communication between the Bahr-el-Ghazal and Gulfei on the Shari, and as Colonel Destenave speaks of the former *mouth* of the Bahr-el-Ghazal, it would seem that some of the Shari water formerly made its way to the lake by this route.

M. Duchesne-Fournet's Expedition to Abyssinia.—M. Duchesne-Fournet, to whose expedition to Abyssinia reference has already been made in the *Journal*, has returned to France, and gave an account of his journey at a meeting of the Paris Geographical Society in April last, an abstract being printed (with sketch-map) in the May number of *La Géographie* (pp. 392–395). Although the route traversed little absolutely new ground, the journey appears to have contributed materially to a better mapping of some of the less-frequented provinces of Abyssinia, careful surveys having been executed with the theodolite, with the aid of Lieut. Collat and others of M. Fournet's companions. From Addis Abbaba the expedition went north across the plateaus which separate the capital from the deep cañon of the Blue Nile, which was crossed into Gojam. The capital of this province, which has now been brought under Menelek's direct rule, at present goes by the name of Markos. It formerly bore the name of Monkorer. The expedition traversed Gojam in various directions, visited the source of the Blue Nile (erroneously stated to have been "discovered" by D'Abbadie), executed a survey of Lake Tana, and returned south across the highest part of the Choke range, on which abundant vegetation was found up to a height of over 13,000 feet. The Blue Nile was crossed further west than on the outward journey, and the route continued through the Kuttai district on the south bank, said to have been previously unexplored, though it must have been approached very closely by Neumann. M. Fournet subsequently visited the province of Wallaga.

The Macmillan Expedition to the Blue Nile.—News has just arrived of the failure of the well-equipped expedition under Mr. W. N. Macmillan, an American, to descend the Blue Nile from the Abyssinian highlands to the plains of the Sudan. The expedition was provided with iron punts, in which it started down the river on June 26, but, according to a Reuter telegram from Aden on July 22, two of the punts, which contained a large proportion of the stores, were lost during the passage of the rapids, the occupants swimming ashore, but suffering further loss from a hurricane which swept the gorge during their enforced detention on the river-bank. The expedition was compelled to return to Addis Abbaba, and for the present, at least, the attempt has been abandoned.

Commander Whitehouse's Survey of the Victoria Nyanza.—Commander Whitehouse, who a few years ago executed a survey of the northern shores of the

Victoria Nyanza within the British sphere, has lately been engaged, by agreement with the German authorities, on a survey of the southern half of the lake in the interests of the steam-navigation of its waters. The steamer *Winifred*, which was lately placed on the lake, has completed a circumnavigation, and a regular service between its various shores is contemplated. If this be established, the quickest route to Tanganyika will probably be by the Uganda railway and the Victoria lake.

The Position of Bohodle, Somaliland.—The British field force in Somaliland is accompanied by an officer of the Indian Survey Department, who, as we are informed by the Foreign Office, has made an exact determination of the position of the advanced base at Bohodle, or Bohotle. The co-ordinates thus fixed are lat. 8° 14′ 43″·1 N., long. 46° 20′ 18″·5 E., the position thus obtained being considerably to the west of the supposed position, though the place still remains within the British boundary.

AMERICA.

Exploration and Mining in the Copper River Basin.—The United States Government is continuing its efforts to develop the mining district of the Copper river. The military trail from Valdes over the Thomson pass (see vol. xix. p. 611) was completed in 1900 as far as Taslina river; the Klutina river has been bridged, and ferries established on the other principal tributaries. The geology and mineral resources of parts of the basin are described by Messrs. Schrader and Spencer in a publication of the Geological Survey. The oldest rocks are metamorphic, divided into three series, named the Klutina, Valdes, and Orca, all of which are traversed by intrusions of igneous rocks of a later date than that of the latest intense folding. After the Orca series had been metamorphosed, the region was deeply eroded, the land sank, and three series of beds were deposited—the Chitistone limestone of Carboniferous age, Triassic limestones and shales, and the Kennicott formation of late Jurassic or early Cretaceous age, the last lying unconformably on the upturned edges of the other two. Below the Chitistone limestone lies the Nicolai greenstone, a series of volcanic flows which form an important mass in the Wrangell district. With this are associated all the copper deposits of the basin—the Nicolai mine towards the White river, the Bonanza claim near McCarthy creek, and the deposits on the Kotsina, Kuskulana, and Chitina rivers. A sample from the Bonanza claim yielded over 70 per cent. of copper, some silver, and a trace of gold. Several claims have also been located on the shores and islands of Prince William sound. Quartz gold is known only at McKinley lake, on the north side of the Copper delta. Of placer mines, the most promising are those of the Chestochina river. The gold seems to have travelled for some distance, but the fragments of schist and quartz which frequently cling to it show its origin from vein deposits. Engineers regard the Valdes route as practicable for the construction of a railway to the Copper river. A branch would then be carried to the Kotsina and Chitina copper districts, and eventually the line might be extended by way of Mentasta pass to Eagle city. Regarding the occurrence of coal in the Copper basin, nothing definite is known at present. In other parts of Alaska, however, coalfields have been discovered. Mr. John Kirsopp, junior, gave details of several seams of lignite in Cook inlet and on the Sushitna river before the Institution of Mining Engineers in 1901. He also described the Chilcat coalfield, and those of south-eastern Alaska, Vancouver, and British Columbia. The coal of Queen Charlotte island compares very favourably with that of other Pacific coalfields, and, as the limited area of coal-seams in Vancouver is being rapidly exhausted, Queen Charlotte coal will probably soon be placed on the market.

Alaskan Survey Programme for 1903.—The work of surveying and mapping the mining region of Alaska will, we learn from the June number of the *National Geographic Magazine*, continue to be actively prosecuted during the present summer. The districts to which special attention will be devoted will be the Seward peninsula, Yukon and Tanana goldfields, and the Kayah island and Controller bay petroleum and coal fields. The mining districts of south-east Alaska will also be examined.

New Survey of the Colorado Cañon.—According to a note in the *National Geographic Magazine* for April last, a re-survey of the Grand Cañon of the Colorado has lately been carried out for the U.S. Geological Survey by Mr. F. E. Matthes. The new map, which is to embody the results of this survey, will be on the scale of one mile to the inch, with contours 50 feet apart, and will show all the topographical features in true proportion. The average width of the cañon from rim to rim is stated to be less than 10 miles at its widest, and to be frequently as little as 8 miles. On the south side the depth is under a mile, but from the more elevated north rim the drop averages considerably over a mile, and in many places exceeds 6000 feet.

The Degree Measurement in Ecuador.—The report by M. Poincaré to the Paris Academy of Sciences on the work carried out in 1902 by the French expedition for the remeasurement of an arc of the meridian in Ecuador, is printed in the *Comptes Rendus* for April 6 in the present year. While regretting that unfavourable weather conditions and other obstacles have retarded the progress of the work so that it is now some six months behind the calculated programme, M. Poincaré announces that the results are so far eminently satisfactory, the highest degree of accuracy having been maintained throughout. The measurement of angles had been rendered exceedingly difficult by the unusual amount of mist and clouds in which the summits were enveloped, and which hindered all work for days together. The preliminary reconnaissance had given no indication of such a state of things, and it is suggested that the volcanic disturbances, which seem to have spread last year from the West Indies to the Cordillera, may have had some influence on the meteorological conditions. Another difficulty arose from the interference with the signals, both by the native Indians and by the whites, which every effort seemed powerless to prevent, and which sometimes involved the repetition of whole sections of the work. In the previous season (cf. *Journal*, vol. xx. p. 343) two bases had been measured—the one in the neighbourhood of Riobamba, carried out both with the bimetallic bar and with the Jäderin apparatus; the other in the north, at El Vinculo, with the latter only. The reduction of the observations has since been effected, and the results are now presented. The main base at Riobamba was divided into two sections, and the southern of these was measured twice by each method, the difference between the two results with the metal bar amounting to only 6·6 millimetres, or $\frac{1}{500000}$ of the total length. The results for the whole base obtained with the Jäderin apparatus showed a close agreement with the value adopted as the result of the measurement with the bimetallic bar, that given by the steel wire being, however, more dependable than by the brass, and it is estimated that this method may be trusted to be correct within $\frac{1}{100000}$ or $\frac{1}{200000}$. The northern base, which will serve only as a control, was measured with the Jäderin wires only; but for the third base, to be eventually measured on the seashore near Payta, the bar will probably be employed. The principal and secondary astronomical observations have all been made, and the results are recorded as regards the latitude of the main stations—Payta, Riobamba, Panecillo, and Tulcan; the differences in longitude had not been completely worked out. It was in the geodetic work that the principal delay had occurred, and out of thirty stations six or seven remained to be occupied. A number of observations for the latitude of stations of the third order had been made, and much magnetic and topographical work done, including a map, on the scale of 1:500,000, of the Inter-Andine region. The levelling operations were to be begun during the present season, in which it is also hoped to complete the observations in the northern section, to carry forward the geodetic work in the southern section, as well as certain additional astronomical observations; leaving for succeeding years the geodetic measurements in the Cuença-Payta section, the measurement of the Payta base, the pendulum observations (which have lately been in abeyance), and, if possible, the connection of Puna island with the southern series.

The Blackwater Rivers of South America.—The subject of these rivers, which for many years have attracted special attention on the part of travellers and geographers, is exhaustively discussed in the latest issue of the *Münchener Geographische Studien* by Dr. Josef Reindl. With characteristic German thoroughness, the author begins with a sketch of the whole physical geography of the region in which such black-water rivers are met with, and which, as he shows, embraces a far larger area than was supposed by Humboldt, one of the first travellers to approach the subject in a scientific spirit, though the phenomenon had been noticed even on the occasion of Orellana's discovery of the course of the Amazon. Under the heading "Hydrography" we find a detailed description of the rivers themselves, which are especially characteristic of British Guiana, the region of the upper Orinoco and Rio Negro, the upper and lower Amazon valley, and the Brazilian mountain region of the Serra do Mar. Then follow brief accounts of certain special features, such as the occurrence of swamp formations, etc., in the domain of the black-water rivers, and the analogies presented by the rivers of other continents; while the final section of all discusses the cause of the phenomenon, and thus forms the climax of the whole study, to which alone detailed reference need be made here. After summarizing, in chronological order, the opinions which have been expressed as to the cause of the coloration from the time of Robeiro de S. Payo (1743) onwards, Dr. Reindl examines the general principles concerned in the coloration of water, showing that absolutely pure water seen from above appears absolutely black when of sufficient depth to allow of the absorption of all the rays which strike it, but that it has in itself a blue colour when the rays pass through it to the eye, as it absorbs those of all other colours contained in white light more readily than the blue. This blue colour is modified by the presence either of suspended particles or dissolved substances. Applying these principles, he shows that the great clearness of the black-water rivers would account in a measure for their dark colour when of sufficient depth, but that as they appear dark also in shallow places this cannot be the efficient reason. Such streams occur only in regions where large masses of decaying vegetable matter are present, and their water is exceptionally rich in dissolved organic matter (humic acids and their compounds). They are also only found in regions, the geological formations of which are rich in silicates (gneiss, granite, sandstone, etc.), and rivers which pass out of these formations into limestone regions at once lose their black colour. These facts permit a solution of the problem, for Dr. Reindl has found by laboratory experiments that water mixed with peat or other humus only acquired a dark colour in the presence of alkalis such as are derived from the silicates of the geological formations above alluded to. The loss of the dark colour in association with limestone is due to the chemical combinations which take place between the organic acids and the calcium or magnesia, the resulting products being not readily dissolved, and therefore falling to the bottom. This is the cause of the dark colour of the beds of the white-water streams, whereas those of the black-water streams, from a parallel chemical reason, are generally white.

The Saramacca River, Dutch Guiana.—A brief account of this expedition appears in the *Tijdschrift van het K. Nederl. Aardr. Genootschap*, Deel. xx No. 4. The leader, Herr A. J. van Stockum, and his companions left their camp at the confluence of the Saramacca and Tukumuta on March 6 last, and after three days reached a fall about 16 feet high, which necessitated a portage. Two days' journey further upstream the Tarve creek was passed, possibly a connection with the Surinam river, and then the Saramacca became shallow, and was encumbered with bushes and fallen trunks. On the 16th the obstacles became so numerous that Herr van Stockum decided to proceed no further. A hill about 1600 feet high, which he named the Zuidheuvel (South hill), in lat. 3° 47′ N. approximately, afforded a good view of the country. To the south lay hills connected with a spur of the Wilhelmina range, and at a short distance towards the north-west the southernmost summits of the Emma range (see vol. xx. p. 656), long lofty ridges sloping up from the north and ending in precipices on the south. Probably the observations, when worked out, will show that the watershed between the Surinam and Saramacca converges to the same point, so that the source of the latter river lies at the knot formed by the junction of the three ranges. On his return journey, Herr van Stockum ascended a mountain to the east of the river near Mombasu, which rose fully 2200 feet above its base, and here also he took bearings of the conspicuous points.

Trigonometrical Survey of Brazil.—We learn from *Science* (June 12, 1903) that arrangements have been made by the Brazilian Government for the commencement of a survey of the country on modern scientific lines. Reconnaissance work for the triangulation of the state of Rio Grande do Sul was to be begun this summer by a commission under Colonel F. de Abreu Lima. It is proposed to measure bases at Porto Alegre and Uruguayana, and to connect the two cities by triangulation. The resulting arc will cover about 6½° of longitude in 30° S.

AUSTRALASIA AND PACIFIC ISLANDS.

Expedition to British New Guinea.—An expedition will start very shortly to British New Guinea, equipped by and under the leadership of Major W. Cooke Daniels, who served in the United States Army during the Cuban campaign as Adjutant-General of Division, and has also travelled extensively in the tropics. He will be accompanied by Dr. C. G. Seligmann, late of the clinical laboratory of St. Thomas's Hospital, and a member of the Cambridge Anthropological expedition to Torres strait, New Guinea, and Sarawak, organized by Dr. A. C. Haddon; Dr. W. Mersh Strong, of Trinity College, Cambridge, and Mr. A. H. Dunning. Major Daniels will devote himself mainly to ethnology. Dr. Seligmann is the representative on the expedition of the Cancer Commission, and, with Dr. Strong, will investigate pathological questions of a more general character, as well as help in the ethnological inquiries. Dr. Strong is in charge of the geographical and geological observations, which it is part of the purpose of the expedition to make. The photographic work, including the taking of kinematographs, will be carried out by Mr. Dunning. A schooner yacht, with auxiliary steam-power and carrying a sea-going launch, is being sent out. The scientific equipment has been well considered, and is thoroughly adequate; the various members of the expedition have specially prepared themselves for their several duties. Assistance has been granted by the Royal Society, and a small grant given by the Government Grant Committee, while our own Society has materially helped by the loan of instruments.

POLAR REGIONS.

Ice in the Arctic Seas, 1902.—The annual report for 1902 on the ice-conditions in the arctic seas has been issued by the Danish Meteorological Institute, and, as in former years, is a most useful record, gathered from the observations of various navigators, of the state of those seas during last year. Information has come to hand in somewhat fuller measure than in the previous year, but when the usefulness of the work carried out by the institute is more widely recognized, no doubt the data will be sent in in still greater abundance. After a review of the state of the ice in the different seas around the polar area, the following general conclusions are arrived at. In 1902 the winter ice broke up very late, and the polar ice lay considerably nearer the northern coasts of Asia and Europe than in a normal year. The East Greenland current carried an abnormal quantity of pack-ice, though on the other hand an unusually small number of icebergs were carried from Greenland to the temperate seas, while the extent of polar ice in the northern branches of Baffin bay was smaller than in other recent years. The summer was rough and unsettled in all arctic and subarctic regions (with the partial exception of West Greenland), northerly and easterly winds predominating in the seas north of the Atlantic. These facts quite bear out the conclusions drawn from a consideration of the state of the ice in 1901, viz. that the accumulation of ice north of Spitsbergen caused by the prevailing westerly winds of that year would have an unfavourable influence on the state of the ice round Iceland and Greenland in 1902. Alike in the Barents sea, the region of Franz Josef Land, and around Spitsbergen, East Greenland, and Iceland the conditions were very unfavourable. The north-east, east, and south-east coasts of Spitsbergen were quite inaccessible through the summer; the pack-ice lay in a close broad belt off the coast of East Greenland, rendering access to the northern parts of the coast exceedingly difficult; while round Iceland the state of the ice was more unfavourable than ever since 1892.

MATHEMATICAL AND PHYSICAL GEOGRAPHY.

The Origin of the Mineral Oils.—The results of analyses show that the waters associated with mineral oils almost invariably contain large quantities of sodium chloride; from which the conclusion is drawn that the oil is formed from the remains of marine organisms. According to Ochsenius, an enormous quantity of organisms are destroyed suddenly by the formation and outflow of brine; according to Andrusson, the destruction of life takes place gradually, as, for example, in the Karabugas bay in the Caspian sea. Both hypotheses involve the simultaneous formation of a saline deposit. The Austrian expert, Prof. H. Höfer, who brought forward a number of questions connected with this subject at the first International Petroleum Congress at Paris in August, 1900, which will come up for discussion at the congress at Bukharest this year, has recently pointed out (*Sitzungsberichte der Kaiserlichen Akademie der Wissenschaften in Wien. Mathematisch-Naturwissensch. Klasse*, Bd. cxi. Abt. 1) that such a formation is contrary to observed facts. The salt deposits which do occur in the neighbourhood of oil springs belong to another horizon, and are not structurally related to them. According to Höfer, who has dealt with a large amount of material, the oil-bearing deposits are shallow-water marine deposits, perhaps often formed in bags or inlets. They occur in sandstone consolidated from sand, or in conglomerate from pebbles, and these indicate a sudden inundation from adjacent land; the marine fauna at the place of deposition was destroyed by the sudden influx of fresh water. The phenomenon can be observed on a large scale at the present day on the south and east coasts of Florida, when the occasional outbursts of fresh water from the marshes of the everglades kill the fishes in the surrounding sea in immense numbers.

GENERAL.

Hugi and the Science of Glaciers.—In the twelfth number of the *Münchener Geographische Studien*, Dr. Krehbiel gives a full account of the explorations and researches among the peaks and glaciers of the Bernese Oberland carried out in the first half of the nineteenth century by Franz J. Hugi (1796–1855), a native of Canton Solothurn, and a professor of natural history in its chief town. The writer prefaces his work with a brief summary of the growth of glacial science. He then gives a fairly full account of Hugi's various expeditions above the snow-level, and in conclusion carefully investigates and estimates the importance of his scientific work and the extent to which he advanced the knowledge of the nature of glaciers. Hugi was distinguished, it is pointed out, as the first scientific explorer who was also a mountaineer; as the inventor of winter mountaineering; and the establisher of the fact that the glaciers' advance is not stopped at that season. He made careful and accurate measurements of the motion of the glaciers, and threw some light on the process by which firn or névé is transmuted into ice; he defined "the snow-level," recognized the nature of the glacier granules, and studied the motion of the ice and the origin of its crevasses, laying foundations which his successors have found to a large extent serviceable. Dr. Krehbiel suggests that Hugi's share in the scientific exploration of his native mountains has been recently somewhat overlooked. Full justice was done to it in this country, at any rate, by James Forbes. References to Hugi will be found on twenty-two pages of his 'Travels through the Alps.' Two facsimiles of Hugi's map accompany the treatise.

Seventy-fifth Anniversary of the Founding of the Berlin Geographical Society.—The celebration of the founding of the Berlin Geographical Society, which it is the custom to hold every five years for the purpose of reviewing periodically the condition and progress of the Society, took place this year with exceptional *éclat*, on the occasion of the completion of the seventy-fifth year of the Society's existence. It so happened that the anniversary practically coincided with the seventieth birthday of the veteran German geographer, Baron von Richthofen, and the opportunity was taken to combine the two celebrations. At the meeting held on May 4, the president, Prof. Hellmann, delivered an address, in which, before dealing with the five-yearly period just completed, he passed in review the history of the Society from its foundation in 1828, dividing it into three characteristic epochs. In its early days, in which it enjoyed the support of such masters of the science of geography as Humboldt and Ritter, the Society was concerned rather with the diffusion of a knowledge of geographical work done elsewhere, and a discussion of the results obtained, than with independent exploration; but from about 1859 onwards a period of great exploring activity on the part of its members set in, which especially characterized the work of the Society during the second period. The third period, although continuing the work of its predecessor in this direction to some extent (as, *e.g.*, in the Antarctic), has been characterized by more "intensive" geographical research, in the form of the detailed examination of smaller areas, or the investigation of special problems. It has also been marked by a continuous improvement in the value of the Society's publications, culminating in the inauguration of the present excellent *Zeitschrift*. It has also seen the commencement of that model of bibliographical enterprise, the *Bibliotheca Geographica*, of which the eighth volume was lately issued. This literary activity has been particularly well marked during the last five years, of which a more detailed review was given by

Prof. Hellmann. They have seen the inauguration (in 1901) of the technical meetings of the Society (corresponding to our own afternoon meetings), in which special scientific questions have been discussed. As regards the papers read at the general meetings, a variation in the distribution of the subjects among the continents has been noticeable of late, Africa having yielded the first place in this respect to Asia. The opening of the new premises of the Society in 1899, and the Berlin meeting of the International Geographical Congress in the same year, also fall within the last period of five years. The Society is to be warmly congratulated on its ability to show a record of such excellence, and our best wishes are given to it for the continuance of its career of usefulness. A new departure, which will still further contribute to this in the future, was inaugurated at the meeting by the foundation of the "Ferdinand von Richthofen Stiftung," in honour of the distinguished geographer. A capital sum of 26,000 marks, which had been collected by a committee appointed for the purpose, was handed over to Baron von Richthofen as a fund for the encouragement of geographical progress, the yearly proceeds to be devoted to the support of journeys of geographical research, grants to geographical students, and such other purposes as may eventually be determined.

Geology and Geography.—A section of Prof. Lapworth's anniversary address to the Geological Society on February 20 last was devoted to the somewhat difficult question of the relations between the sciences of geology and geography. The key-note of his remarks was the mutual dependence between the two which has always been, and must continue to exist, cordial recognition being given to the services rendered by geography to geology, no less than *vice versâ*. The two sciences were spoken of as sharing between them the collective study of the Earth, the surface of the globe being regarded as their common limit and common property. As a representative of the physical sciences as contrasted with those related to man, it was only natural that Prof. Lapworth should limit his views to the physical side of geography, which, of course, is the one as to which the difficulty of drawing a dividing-line alone arises. But by leaving out of view the relations of geography to the science of man on the opposite side, he necessarily failed to give prominence to the central distinction between geography as a whole and the sister science, which depends rather on the standpoint of the student and the motive with which his inquiries are made, than on any hard-and-fast dividing-line between portions of a science which is essentially one in regard to the facts which form its basis, though for convenience-sake it may be subdivided. Such limits of time or space as those between the present and the past, or between what lies above or below the existing surface, must be more or less arbitrary and artificial, however convenient for practical purposes; and it is only when he looks beyond the mere surface features of the globe to the effects which these have on the human and other life upon it, that the geographer fully substantiates his claim to be the exponent of an independent science. None the less, our thanks are due to Prof. Lapworth for his generous appreciation of the value of geography, in spite of the tendency which it may occasionally manifest to trespass on ground which the geologist regards as his own.

Marine Investigation: Course of Instruction.—It is announced that, if a sufficient number of students send in their names, a course of instruction on marine investigations will be held at Bergen from September 1 to November 1, by Dr. Johan Hjort and several coadjutors. The course will consist partly of lectures and practical experiments; partly of laboratory work, demonstrations, and excursions. The instruction will be free of charge, but microscopes, etc., must be brought by students. Applications should be made to Dr. Hjort at Bergen before August 15. A similar course was held by the promoters last winter.

OBITUARY.

George Robert Boyle.

We regret to record the death, at the age of sixty, of George Robert Boyle, a Fellow of the Society. Mr. Boyle had been connected for forty-six years with the British and Foreign Blind Association. Mr. Boyle took the greatest interest in his work, and became the inventor of many improvements in connection with the making of Braille books and implements for the blind, and also of the cheapest and best embossed maps for the blind and seeing, several of which are at the Society, and many more in use at the large schools. In 1897 the British and Foreign Blind Association brought out in interpointed Braille 'the story of Nansen as told by himself.' It was an admirable stereotyped and easily read volume, with close lines on each page, a great improvement on the original French Braille system, and even on the perfectioned system as introduced by Dr. Armitage, the founder of the institution. Mr. Boyle deserved the greatest credit for the complete success which had at last crowned his work.

GEOGRAPHICAL LITERATURE OF THE MONTH.

Additions to the Library.

By EDWARD HEAWOOD, M.A., *Librarian*, R.G.S.

The following abbreviations of nouns and the adjectives derived from them are employed to indicate the source of articles from other publications. Geographical names are in each case written in full:—

A. = Academy, Academie, Akademie.
Abh. = Abhandlungen.
Ann. = Annals, Annales, Annalen.
B. = Bulletin, Bollettino, Boletim.
Com. = Commerce.
C. Rd. = Comptes Rendus.
Erdk. = Erdkunde.
G. = Geography, Geographie, Geografia.
Ges. = Gesellschaft.
I. = Institute, Institution.
Iz. = Izvestiya.
J. = Journal.
k. u. k. = kaiserlich und königlich.
M. = Mitteilungen.
Mag. = Magazine.
Mem. = Memoirs, Mémoires.
Met. = Meteorological.
P. = Proceedings.
R. = Royal.
Rev. = Review, Revue.
S. = Society, Société, Selskab.
Sitzb. = Sitzungsbericht.
T. = Transactions.
V. = Verein.
Verh. = Verhandlungen.
W. = Wissenschaft, and compounds.
Z. = Zeitschrift.
Zap. = Zapiski.

On account of the ambiguity of the words *octavo*, *quarto*, etc., the size of books in the list below is denoted by the length and breadth of the cover in inches to the nearest half-inch. The size of the *Journal* is 10 × 6½.

A selection of the works in this list will be noticed elsewhere in the "Journal."

EUROPE.

Alps. *Alpine J.* **21** (1903): 417–420. **Brigg.**
The Peaks, Passes, and Glaciers between the Col de la Galise, and the Aiguille de la Sassière and the Bassac Nord (Central Graians). By W. A. Brigg. *With Map.*

Alps. **Penck and Brückner.**
Die Alpen im Eiszeitalter. Von Dr. A. Penck und Dr. E. Brückner. Lieferung 5. Leipzig: C. H. Tauchnitz, 1903. Size 10½ × 7½, pp. 433–544. *Map and Illustrations. Presented by the Publisher.*

Alps—Chamonix. **Whymper.**

Chamonix and the Range of Mont Blanc. A Guide by Edward Whymper. Eighth Edition. London: John Murray, 1903. Size 7½ × 5, pp. xiv. and 206. *Price 3s. net. Maps and Illustrations. Two copies. Presented by the Author and Publishers.*

Alps—Mont Blanc. *Ann. Club Alpin Français* 28 (1901): 425-435 **Forel.**

Les Glaciers du Mont-Blanc en 1780. Par M. F.-A. Forel. *With Plate.*

Austria—Historical. **Pichler.**

Austria Romana. Geographisches Lexikon aller zu Römerzeiten in Östreich genannten Berge, Flüsse, Häfen, Inseln, Länder, Meere, Postorte, Seeen, Städte, Strassen, Völker. I. Von Fritz Pichler. (Quellen und Forschungen zur alten Geschichte und Geographie, herausgegeben von W. Sieglin. Heft 2.) Leipzig: E. Avenarius, 1902. Size 9½ × 6½, pp. 102. *Map.*

Azores. *B.S.R. Belge G.* 27 (1903): 129–157. **Verschuur.**

Les îles Açores. *With Map.*

Translated from the Dutch of G. Verschuur (*Tijdschrift*, Netherlands Geographical Society).

Balkan Peninsula. **Curtis.**

The Turk and his Lost Provinces. Greece, Bulgaria, Servia, Bosnia. By William Eleroy Curtis. Chicago, etc.: Fleming H. Revell Co., 1903. Size 9 × 6, pp. 396. *Illustrations. Price 7s. 6d.*

On account of the Balkan countries and Greece for the general reader, by an American journalist.

Baltic. *Petermanns M.* 49 (1903): 25–28, 77–83. **Geinitz.**

Die geographischen Veränderungen des südwestlichen Ostseegebiets seit der quartären Abschmelzperiode. Von Prof. Dr. E. Geinitz. *With Map.*

Belgium—Coal. *La G., B.S.G. Paris* 7 (1903): 284–288. **Ertborn.**

Le bassin houiller de la campine. Par Baron O. van Ertborn.

Bulgaria. *Deutsch. Rundschau G.* 25 (1903): 369–370. ———

Die Weingartenfläche Bulgariens.

Central Europe. **Partsch.**

Central Europe. By Joseph Partsch. London: W. Heinemann, 1903. Size 9½ × 6, pp. xiv. and 358. *Maps and Diagrams. Price 7s. 6d. Presented by the Publisher.* [To be reviewed.]

Denmark—Language. **Harvey.**

Danish Self-taught, with Phonetic Pronunciation (Thimm's System), containing Vocabularies, Idiomatic Phrases, and Dialogues; Elementary Grammar; Commercial, Trading, and Legal Terms; Travel Talk; Shooting, Fishing, Photography, Cycling, etc., etc. Edited by W. F. Harvey. London: E. Marlborough & Co., 1903. Size 7 × 4½, pp. 120. *Price 2s. 6d. Presented by the Publishers.*

Denmark—Meteorology. ———

Nautical-Meteorological Annual 1902, published by the Danish Meteorological Institute. Kjøbenhavn: G. E. C. Gad, 1903. Size 12½ × 9½, pp. xxxii. and 182. *Charts. Presented by the Danish Meteorological Institute.*

Includes the annual report for 1902 on ice in the Arctic seas (*ante*, p. 218).

France—Ain Valley. **Delebecque.**

Contribution à l'étude des terrains glaciaires des vallées de l'Ain et de ses principaux affluents. Par A. Delebecque. Paris: C. Béranger, 1902. Size 10 × 6½, pp. 14. *Map. Presented by the Author.*

France—Alps. *B.S.G. Com. Paris* 25 (1903): 28–38. **Bougault.**

Richesses hydrauliques des Alpes françaises, leur situation actuelle, leur avenir. Par Paul Bougault.

Norway. ———

Norge i det Nittende Aarhundrede. Tekst og Billeder af Norske Forfattere og Kunstnere. 2 Volumes. Kristiania: A. Cammermeyer, 1900. Size 13 × 10½, pp. (vol. i. 436); (vol. ii. 468). *Maps. Plates and Illustrations. Presented by Dr. Fridtjof Nansen.*

A superbly illustrated work on every branch of knowledge regarding Norway, including articles by leading authorities on trade, industries, fisheries, statistics, literature, art, etc., as well as on the physical aspects of the country.

Sweden—Geology. **Blomberg and Holm.**

Geologisk Beskrifning öfver Nerika och Karskoga Bergslag samt Fellingsbro Härad. Af Albert Blomberg och G. Holm. (Sveriges Geolog. Undersökning. Stockholm, 1902. Ser. Ca., No. 2.) Size 12½ × 10, pp. 124. *Maps and Plates.*

Sweden—Geology. **Blomberg and Lundbohm.**

Geologisk Beskrifning öfver Blekinge Län. Af Albert Blomberg, jamte Redogörelse för Stenindustrien inom Blekinge Län af Hjalmar Lundbohm. (Sveriges Geolog. Undersökning, Ser. Ca., No. 1.) Stockholm, 1900. Size 12½ × 10, pp. 110. *Maps and Plates.*

Sweden—Geology. **Holm and Munthe.**

Kinnekulle. Dess Geologi och den tekniske Användningen af dess Bergarter. Af. G. Holm och H. Munthe. (Sveriges Geolog. Undersökning, Ser. Ca., No. 172.) Stockholm, 1901. Size 12½ × 10, pp. 144. *Maps.*

Sweden—Norrland. **Ahlenius.**

Angermanälfvens flodområde. En geomorfologisk-antropogeografisk Undersökning af Karl Ahlenius. [*Résumé* in German.] Uppsala: Almqvist & Wiksell, 1903. Size 10 × 6½, pp. xii. and 220. *Maps.*

Geomorphological and anthropogeographical studies on the region of the Ångerman-Elf.

Switzerland. *C. Rd.* **136** (1903): 1103–1104. **Lugeon, Ricklin, and Perriraz.**

Sur les bassins fermés des Alpes suisses. Note de M. Lugeon, M. Ricklin et F. Perriraz.

Switzerland. ———

Table de Récapitulation des Principaux Résultats des observations hydrométriques suisses pour l'année 1894. Berne, 1901. Size 15 × 10, pp. 44.

Switzerland. ———

Tableaux graphiques des observations hydrométriques suisses et des températures de l'air et des hauteurs pluviales pour l'année 1900. Ditto, 1901. Bern, 1902. Size 15 × 10, pp. (1900) 24; (1901) 20. *Diagrams.*

Switzerland—Guide. ———

Guide to Switzerland. London: Macmillan & Co., 1903. Size 7 × 4½, pp. cvi. and 236. *Maps and Plans. Price 5s. net. Presented by the Publishers.*

Turkey—Macedonia. *Rev. Française* **28** (1903): 65–86, 129–169. **Povolni.**

La solution du problème Macédonien. Par I. V. Povolni. *With Map.*

United Kingdom—Ealing. **Brown.**

Recent Discoveries in Relation to Pre-historic Man in Ealing. By Prof. Jno. Allen Brown. (Abstract of lecture before the Ealing Nat. Sci. and Microsc. Soc., January 25, 1902.) Size 8½ × 5½, pp. 12. *Illustration.*

United Kingdom—Ireland. *Sci. P.R. Dublin S.* **9** (1903): 575–582. **Wright.**

Some Results of Glacial Drainage round Montpelier Hill, co. Dublin. By W. B. Wright. *With Map and Plate.*

United Kingdom—Leicester. **Fox-Strangways.**

Memoirs of the Geological Survey. England and Wales. The Geology of the Country near Leicester. (Explanation of Sheet 156.) By C. Fox-Strangways. London: E. Stanford, 1903. Size 10 × 6, pp. vi. and 122. *Illustrations. Price 3s. Presented by the Geological Survey.*

United Kingdom—Meteorology. **Buchan and Omond.**
T.R.S. Edinburgh **42** (1902): pp. xiv. and 552.

The Ben Nevis Observations, 1888–1892. Edited by Dr. A. Buchan and R. T. Omond. *With Illustrations.*

United Kingdom—Mines. **Foster**

Mines and Quarries. General Report and Statistics for 1901. Part iii.—Output. Edited by C. le Neve Foster. London, 1902. Size 13½ × 8½, pp. 278.

United Kingdom—Scotland—Skye. **Harker**
T.R.S. Edinburgh **40** (1901–1902): 221–252.

Ice-Erosion in the Cuillin Hills, Skye. By A. Harker. *With Map.*

United Kingdom—Wales. *T.R.S. Edinburgh* **40** (1901–1902): 419–467. **Jehu.**
A Bathymetrical and Geological Study of the Lakes of Snowdonia and Eastern Carnarvonshire. By T. J. Jehu. *With Maps and Plates.*

United Kingdom—Wiltshire. **Reid.**
Memoirs of the Geological Survey. England and Wales. No. 298. The Geology of the Country around Salisbury. (Explanation of Sheet 298.) By Clement Reid. London, 1903. Size 9½ × 6, pp. 77. *Price* 1*s*. 3*d*.

ASIA.

Asia—Orography. *Deutsch. Rundschau G.* **25** (1903): 359–366. **Krebs.**
Asiens Gebirgsbau. Von Dr. N. Krebs.
Analysis of Suess' work.

Central Asia—Mosques. *G. Tidskrift* **17** (1903–1904): 41–49. **Olufsen.**
Centralasiens Moskeer, Medresseer og deres Gejstlighed. Af Premierløjtnant O. Olufsen.

Ceylon. **Hassan.**
S.A. Le Prince Ibrahim Hassan. L'ile de Ceylan. Conférence faite à la Société Khédiviale de Géographie, le 30 novembre 1901. Le Caire, 1902. Size 11 × 7½, pp. 44.

China. *Izvestiya Imp. Russ. G.S.* **38** (1902): 371–466. **Ladigin.**
Some facts on the condition of trade in Kansu, Tibet, and Mongolia collected by the expedition of 1899–1902 sent by the Imperial Russian Geographical Society to Central Asia. By V. F. Ladigin. [In Russian.]

China—Kwang-chou-wan. *B.S.G. l'Est* **23** (1902): 393–408. **Vialet.**
Note d'ethnographie sur Quang-Tchéou-Wan. Par le Dr. Vialet.

China—Mongolia. *Izvestiya Imp. Russ. G.S.* **38** (1902): 467–502. **Svyechnikoff.**
Cattle-breeding in North-Eastern Mongolia, and the trade in cattle on the frontier of Trans-Baikal. By A. I. Svyechnikoff. [In Russian.]

China—Shantung. *Asien* **2** (1902): 7–9, 21–24, 40–42. **Gaedertz.**
Schantungs wirtschaftliche Bedeutung. Von A. Gaedertz.

China—Tea Trade. *Asien* **2** (1902): 24–26, 42–45; (1903): 79–82. **Kränsel.**
Der chinesische Theehandel. Wirtschaftsgeschichtliche Studie. Von Dr. P. Kränsel.

Chinese Empire—Mongolia. **Lesdain.**
Comte de Lesdain. En Mongolie. (15 Juin—22 Septembre 1902.) Paris: A. Challamel, 1903. Size 7½ × 5½, pp. 202. *Illustrations. Price* 3*s*.

French Indo-China. *B. L'École Française d'Extrême-Orient* **3** (1903): 1–17. **Maspero.**
Say-fong, une ville morte. Par G. Maspero. *With Map.*

French Indo-China—Railways. *B. Comité l'Asie Française* **3** (1903): 135–139. **Caix.**
Questions de chemins de fer indo-chinois. Par Robert de Caix. *Map.*

India. **Strachey.**
India, its Administration and Progress. By Sir John Strachey. Third Edition. Revised and Enlarged. London, etc.: Macmillan & Co., 1903. Size 9 × 5½, pp. xxii. and 516. *Map. Price* 10*s*. *net. Presented by the Publishers.*

India—Bengal. **Bradley-Birt.**
Chota Nagpore. A Little-known Province of the Empire. By F. B. Bradley-Birt. With an Introduction by the Right Hon. the Earl of Northbrook. London: Smith, Elder, & Co., 1903. Size 9½ × 6, pp. xiv. and 310. *Map and Illustrations. Price* 12*s*. 6*d*. *net. Presented by the Publishers.*

Russia—Siberia. **Titovski.**
Trav. Sous-Sect. Troitzkossawsk-Kiakhta S. Imp. Russe G. **4**, 1901 (1902): 81–96.
Excursion au Mont de Bourine-khan en été 1900. Par N. G. Titowski. [In Russian.]

Russia—Siberia. *Asien* **2** (1903): 85–90. **Toepfer.**
Russland auf dem Wege zur Vorherrschaft in Ostasien. Nach dem Bericht des Finanzministers Witte über seine Reise nach dem fernen Osten. Von Hauptmann H. Toepfer.

Russia—Siberia—Lake Baikal. **Immanuel.**
Vierteljahrs. G. Unterricht 2 (1903): 152-156.

Der Baikalsee. Von Hauptmann Immanuel.

Turkey. ——

Mining Industries and Forestry in Turkey. Foreign Office, Miscellaneous, No. 589, 1903. Size 9½ × 6, pp. 58. *Price* 3*d.*

Turkey—Asia Minor. **Schaffer.**
Petermanns M. Ergänzungsheft Nr. 141 (1903): pp. 110.

Cilicia. Von Dr. Franz X. Schaffer. *With Maps.*

Turkey—Palestine. **Hölscher.**

Quellen und Forschungen zur alten Geschichte und Geographie. Heft 5. Gustav Hölscher. Palästina in der persischen und hellenistischen Zeit. Eine historisch-geographische Untersuchung. Berlin: Weidmann, 1903. Size 10 × 6½, pp. xii. and 100. *Price* 3*s.*

Turkey—Syria. *B.S.R.G. d'Anvers* 27 (1903): 19-65. **Castiau.**

En Syrie (le long du chemin des pèlerins de la Mecque). Par M. Castiau. *With Map and Illustrations.*

AFRICA.

Africa—Historical. **Ruge.**

Topographische Studien zu den Portugiesischen Entdeckungen an den Küsten Afrikas. I. Von Sophus Ruge. (Des xx. Bandes der Abhandlungen der philologisch-historischen Klasse der Königl. Sächsischen Gesellschaft der Wissenschaften. No. vi.) Leipzig: B. G. Teubner, 1903. Size 11½ × 8, pp. 110. *Price* 4*s.* 6*d.*

Algeria. **Marçais.**

Service des Monuments Historiques de l'Algérie. Les Monuments Arabes de Tlemcen. Par MM. William Marçais et Georges Marçais. Paris: Albert Fontemoing, 1903. Size 10 × 6½, pp. 358. *Illustrations. Price* 16*s.*

Congo. *Mouvement G.* 19 (1902): 617-620. **Mees.**

Une expédition Portugaise au Congo en 1512. Par Dr. J. Mees.

Congo State. *B.S.G. Italiana* 4 (1903): 110-117. **Ascenso.**

Nel Congo indipendente. Dal Sancuru al Lago Moero. Lettera del dott Michele Ascenso. *With Illustration.*

Congo State. **Descamps.**

New Africa. An Essay on Government Civilization in New Countries, and on the Foundation, Organization, and Administration of the Congo Free State. By E. Descamps. Translated from the French. London: S. Low, Marston & Co., 1903. Size 8½ × 5½, pp. xvi. and 402. *Presented by the Publishers.*

Congo State. ——

The Truth about the Civilization in Congoland. By a Belgian. London: S. Low, Marston & Co., 1903. Size 9 × 6, pp. 180. *Map. Price* 1*s. net. Presented by Dr. Felkin.*

Merely a collection of extracts containing laudatory pronouncements on the work of the Congo State.

Congo State—Katanga. **Wauters and Cornet.**
Mouvement G. 19 (1902): 589-594, 613-617.

La région minière du Katanga. Par A. J. Wauters et J. Cornet. *With Maps.*

Egypt—Meteorological Observations. ——

A Report on the Meteorological Observations made at the Abbassia Observatory, Cairo, during the year 1900, together with the Alexandria Mean Values derived from the Observations of the previous ten years, and Climatological Stations, also some Magnetic and Seismological Observations. Cairo, 1902. Size 7½ × 11, pp. 176. *Diagrams.*

Egyptian Sudan. **Sykes.**

Service and Sport on the Tropical Nile. Some Records of the Duties and Diversions of an Officer among Natives and Big Game during the re-occupation of the Nilotic Province. By Captain C. A. Sykes. London: J. Murray, 1903. Size 8½ × 6, pp. xii. and 306. *Map and Illustrations. Price* 12*s. net. Presented by the Publishers.*

German East Africa. **Lommel.**
Berichte Land- u. Forstwirtschaft Deutsch-Ostafrika **1** (1903): 341–350.
Bericht über eine Reise im Bezirke Kilwa zur Festellung des Vorkommens und zur Beobachtung der Lebensgewohnheiten der Tsetsefliege. Von V. Lommel.

German East Africa. *Deutsch. Kolonialzeitung* **20** (1903): 143–145. **Macco.**
Deutsch-Ostafrikas Lagerstätten nutzbarer Mineralien. Von — Macco. *With Map.*

German East Africa. **Zimmermann.**
Berichte Land- u. Forstwirtschaft Deutsch-Ostafrika **1** (1903): 351–381.
Ueber einige auf den Plantagen von Ost- und West-Usambara gemachte Beobachtungen. Von Prof. Dr. A. Zimmermann. *With Illustrations.*

German East Africa. ——
Berichte Land- u. Forstwirtschaft Deutsch-Ostafrika **1** (1903): 205–323.
Auszüge aus den Berichten der Bezirksämter, Militärstationen und anderer Berichtsstellen über wirtschaftliche Entwicklung im Berichtsjahr von 1. April 1901 bis 31. März 1902.

Madagascar. *Rev. Colon.* (1903): 432–450. **Lemoine.**
Rapport sur une mission géologique dans le nord de Madagascar. Par P. Lemoine.

Madagascar. *Rev. Madagascar* **5** (1903): 306–336. **Lemoine.**
L'Extrême-Nord de Madagascar. Par P. Lemoine. *With Maps and Illustrations.*

Morocco. *Rev. Gén. Sci.* **14** (1903): 73–87, 132–147. **Bernard.**
Les Productions naturelles, l'Agriculture, l'Industrie et le Commerce au Maroc. Par A. Bernard. *With Illustrations.*

Morocco. *Rev. Gén. Sci.* **14** (1903): 190–208, 258–274, 314–327. **Doutté.**
Les Marocains et la Société marocaine. Par E. Doutté. *With Illustrations.*

Morocco. *Rev. Gén. Sci.* **14** (1903 : 12–28. **Machat.**
La Géographie physique du Maroc. Par J. Machat. *With Maps and Illustrations.*

Nigeria. **Bedwell.**
Southern Nigeria. Report for 1901. Colonial Reports, Annual No. 381, 1903. Size 10 × 6½, pp. 34. *Price* 2½*d.*

Nigeria. *J. African S.* **2** (1903): 235–260. **Upward.**
The Province of Kabba, Northern Nigeria. By Allen Upward.

Nigeria. *Church Miss. Intelligencer* **54** (1903): 321–333. ——
British Nigeria. By F. B. *With Map.*

Nile. *Scottish G. Mag.* **19** (1903): 225–248. **Cadell.**
The Development of the Nile Valley, past and future. By H. M. Cadell. *With Map, Plans, and Illustrations.*

North Africa. *B.S. Languedoc. G.* **25** (1902): 129–158, 267–297, 396–409. **Duponchel.**
La Colonisation française dans le nord de l'Afrique et la culture de l'olivier dans l'ancienne Byzacène (Tunisie centrale). Par A. Duponchel.

Senegal. *B.S.G. Com. Bordeaux* **29** (1903): 65–72, 113–118, 145–151, 182–187. **Daunas.**
Un voyage d'affaires au Sénégal (Aout-Septembre 1898). Par M. Daunas.

South Africa. *Contemporary Rev.* **83** (1903): 540–553. **Fox, Macdonell, and Seebohm.**
The Native Labour Question in South Africa. By A. R. Fox, J. Macdonell, C.B., and H. E. Seebohm.

South Africa—Railways. *Engineering Mag.* **23** (1902): 183–194. **Key.**
Railway Development in Federated South Africa. By A. Cooper Key. *With Map and Illustrations.*

South-West Africa. **Baum.**
Kolonial-Wirtschaftliches Komitee. Kunene—Sambesi Expedition. H. Baum, 1903. Im Auftrag des Kolonial-Wirtschaftlichen Komitees herausgegeben von Prof. Dr. O. Warburg. Berlin: E. S. Mittler & Sohn, 1903. Size 10 × 6½, pp. xii. and 594. *Map, Plates, and Illustrations. Price* 18*s.*

Sudan. *Questions Dipl. et Colon.* 15 (1903): 545–572. **Lorin.**

Les pays du Tchad et l'Europe. Par H. Lorin. *With Map.*

Togo. *Deutsch. Kolonialzeitung* **20** (1903): 153–155. **Heim.**

Grenzverhältnisse und Eisenbahnprojekt in Togo. Von Dr. E. Heim. *With Map.*

West Africa. *Rev. Colon.* (1903): 407–431. **Cureau.**

Rapport sur les travaux de la Mission française de délimitation Congo-Cameroun. Par M. le Dr. Cureau.

NORTH AMERICA.

Canada. *Monthly Rev.* 11 (1903): 48–61. **Hanbury-Williams.**

The American Invasion of North-Western Canada. Winnipeg. By C. Hanbury-Williams.

Canada—British Columbia. **Smith.**
Mem. American Museum Nat. Hist. 4 (1903): 133–192.

Publications of the Jesup North Pacific Expedition. IV.—Shell-Heaps of the Lower Fraser River, British Columbia. By H. I. Smith. *With Plates.*

Canada—Huron. *J.G.* 2 (1903): 144–155. **Jefferson.**

The Geography of Lake Huron at Kincardine, Ontario. By Prof. M. S. W. Jefferson. *With Map and Illustrations.*

Canada—Nova Scotia. ———

Report of the Department of Mines, Nova Scotia, for the year ending September 30, 1902. Halifax, N.S., 1903. Size 10 × 6½, pp. 116. *Plans.*

Canada—Rocky Mountains. *Alpine J.* 21 (1903): 363–377. **Woolley.**

Six Weeks in the Canadian Rocky Mountains. By Hermann Woolley. *With Map and Illustrations.*

Canada and Alaska—Boundary. ———

Convention between the United Kingdom and the United States of America for the Adjustment of the Boundary between the Dominion of Canada and the Territory of Alaska. Signed at Washington, January 24, 1903. (Treaty Series, No. 4, 1903.) London: Eyre & Spottiswoode, 1903. Size 10 × 6½, pp. 6. *Price ½d.*

Newfoundland—Fisheries. *Nineteenth Century* 53 (1903): 924–935. **McGrath.**

The Bond-Hay Treaty. A new phase of the Anglo-American Dispute. By P. T. McGrath.

United States—Appalachians. ———

Message from the President of the United States, transmitting a Report of the Secretary of Agriculture in relation to the Forests, Rivers, and Mountains of the Southern Appalachian Region. Washington, 1902. Size 12 × 8, pp. 210. *Maps and Plates.*

United States—Florida. *J.G.* 2 (1903): 10–21. **Phillips.**

How the Mangrove Tree adds New Land to Florida. By O. P. Phillips. *With Illustrations.*

United States—Geology. ———

Department of the Interior. United States Geological Survey. Twenty-second Annual Report of the Director of the United States Geological Survey to the Secretary of the Interior. 1900–1901. In four parts: Part i. Director's Report and a Paper on Asphalt and Bituminous Rock Deposits (pp. 464); Part ii. Ore Deposits (pp. 888); Part. iii. Coal, Oil, Cement (pp. 764); Part iv. Hydrography (pp. 690). Washington, 1901–1902. Size 11½ × 8. *Maps and Illustrations. Presented by the U.S. Geological Survey.*

United States—Geology. ———

Department of the Interior. United States Geological Survey. Twenty-third Annual Report of the Director of the United States Geological Survey to the Secretary of the Interior. 1901–1902. Washington, 1902. Size 11½ × 8, pp. 218. *Maps and Portrait. Presented by the U.S. Geological Survey.*

United States—Historical. **Hulbert.**

Historic Highways of America. Vol. i. Paths of the Mound-building Indians and Great Game Animals. Vol. ii. Indian Thoroughfares. Vol. iii. Washington's Road (Nemacolin's Path). The First Chapter of the Old French War. Vol. iv.

Braddock's Road and Three Relative Papers. Vol. v. The Old Glade (Forbes's) Road (Pennsylvania State Road). By Archer Butler Hulbert. Cleveland, Ohio: A. H. Clark Co., 1902–1903. Size 7½ × 5, pp. (vol. i.) 140; (vol. ii.) 153; (vol. iii.) 216; (vol. iv.) 214; (vol. v.) 206. *Maps and Illustrations. Price* (vols. i. and ii.) $2; (vols. iii.–v.) $2.50.

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Some Glacial Conditions and Recent Changes on Long Island. By Edward P. Buffet. *Illustrations.*

United States—Washington. *J. Geology* **11** (1903): 166–177. **Smith.**
Anticlinal Mountain Ridges in Central Washington. By G. O. Smith.

United States—Wyoming. *J. Geology* **11** (1903): 216–223. **Salisbury and Blackwelder.**
Glaciation in the Bighorn Mountains. By R. D. Salisbury and E. Blackwelder.

CENTRAL AND SOUTH AMERICA.

Bolivia. ——
Anexos a la Memoria del Ministro de Relaciones Exteriores y Culto presentada al Congreso Ordinario de 1902. La Paz, 1903. Size 11 × 7½, pp. 436. *Presented by M. V. Ballivian.*

Includes, among other documents, an important report on the work of the recent commission for the demarcation of the boundary with Brazil.

Bolivia—Acre Territory. *B. Oficina Nac. La Paz* **2** (1902): 233–242. ——
El contrato sobre el Acre.

Brazil. **Goeldi.**
Against the destruction of White Herons and Red Ibises on the Lower Amazon, especially on the Island of Marajó. By Prof. Dr. Emil A. Goeldi. Translated from the Portuguese into English by W. H. Clifford. Pará (Brazil), 1902. Size 9¼ × 6, pp. 20.

Vigorous protests against the wanton destruction of herons for the sake of their plumes, which threatens their extermination.

Central America—Panama Canal. **Easton.**
Tijds. K. Ned. Aard. Genoots. Amsterdam **20** (1903): 349-376.
Het Panama-Kanaal. Door C. Easton.

Chile—Valparaiso. **Van der Stok.**
Tijds. K. Ned. Aard. Genoots. Amsterdam **20** (1903): 317–348.
De getijden in de haven van Valparaiso. Door Dr. J. P. van der Stok.

Danish West Indies—Santa Cruz. **Millspaugh.**
Flora of the Island of St. Croix. By Dr. C. F. Millspaugh. (Field Columbian Museum, Publication 68, Botanical Series, vol. i. No. 7.) Chicago, 1902. Size 10 × 6½, pp. 441–546. *Map.*

Ecuador—Geodesy. *C. Rd.* **136** (1903): 861–871. **Poincaré.**
Rapport présenté au nom de la Commission chargée du contrôle scientifique des opérations géodésiques de l'Équateur. Par H. Poincaré. *Map.* [Noticed at p. 215.]

Falkland Islands. *Scottish G. Mag.* **19** (1903): 169–183. ——
The *Scotia's* Voyage to the Falkland Islands. By the Leader and Staff of the Scottish National Antarctic Expedition. *With Map and Illustrations.*

Jamaica. **Ford and Finlay.**
The Handbook of Jamaica for 1903, comprising Historical, Statistical, and General Information concerning the Island. Compiled from Official and other reliable Records, by Jos. C. Ford and A. A. C. Finlay. London: E. Stanford, 1903. Size 8½ × 5½, pp. vii., 522, and x. *Map. Price* 7*s.* 6*d. Presented by the Publisher.*

Martinique. *C. Rd.* **136** (1903): 871–876. **Lacroix.**
Principaux résultats de la mission de la Martinique. Par A. Lacroix.

Patagonia. *Z. Ges. Erdk. Berlin* (1903): 167–207. **Steffen.**

Reisenotizen aus West-Patagonien. Von Dr. H. Steffen.

Patagonia. *Quarterly J. Geolog. S.* 59 (1903): 160–179. **Scrivenor.**

Notes on the Geology of Patagonia. By J. B. Scrivenor. *With Map.*

Peru. ——

Perú. A sketch for capitalists, tradesmen, and settlers. A report on the industries that can be developed and on those that might be introduced. Lima, 1903. Size 8 × 5½, pp. 60. *Maps and Illustrations.*

Peru. **Raimondi.**

Antonio Raimondi. El Perú, Estudios Mineralógicos y Geológicos (Primera Serie). Tomo iv. Publicado por la Sociedad Geográfica de Lima. Lima, 1902. Size 12 × 8, pp. xxxviii., 516, and xiv.

Continuation of the publication suspended after the death of the author in 1890.

Peru. *B.S.G. Lima* 12 (1902): 299–358. **Raimondi.**

Estudio geológico del camino entre Lima y Morococha y alrededores de esta hacienda. Por A. Raimondi. *With Map.*

Peru. *B.S.G. Lima* 12 (1902): 290–298. **Robledo.**

Vias de comunicación con el oriente del Perú. Via del Sur. Por L. M. Robledo.

South America. **Reindl.**

Die Schwarzen Flüsse Südamerikas. Hydrographische Studie auf geologisch-orographischer, physikalischer und biologischer Grundlage. Von Dr. J. Reindl. (Münchener geographische Studien herausgegeben von S. Günther. Dreizehntes Stück.) München: T. Ackermann, 1903. Size 9 × 6, pp. 138. *Map.*

South America. *Meteorolog. Z.* 20 (1903): 57–58. **Woeikof.**

Die Isothermen im westlichen tropischen Südamerika. Von A. Woeikof.

South America—Chaco. **Nordenskiöld.**

Präcolumbische Wohn- und Begräbnisplätze an der Südwestgrenze von Chaco. Von Erland Nordenskiöld. (Kongl. Svenska Vetens.-Akad. Handlingar, Bandet 36, No. 7.) Stockholm: P. A. Nordstedt & Söner, 1903. Size 12 × 9½, pp. 22. *Illustrations. Presented by the Author.*

Venezuela—Orinoco. *Ann. Hydrographie* 31 (1903): 166–172. **Eckermann.**

Orinoco Fahrten. Nach Berichten des Kommandos s.m. *Panther.* K.-Kapt. Eckermann.

West Indies—Volcanic Eruptions. *J. Geology* 11 (1903): 199–215. **Curtis.**

Secondary Phenomena of the West Indian Volcanic Eruptions of 1902. By G. C. Curtis. *With Illustrations.*

AUSTRALASIA AND PACIFIC ISLANDS.

Australia. ——

The Year-book of Australia for 1903. Twenty-second year of Publication. London, Sydney, etc. Size 9 × 5½, pp. lx. and 824. *Price* 10*s.* 6*d.* *Presented by the Agent-General for New South Wales.*

Caroline Islands—Yap. *Petermanns M.* 49 (1903): 49–60, 83–87. **Senfft.**

Ethnographische Beiträge über die Karolineninsel Yap. Von A. Senfft.

New Guinea. **Niermeyer.**

Tijds. K. Ned. Aard. Genoots. Amsterdam 20 (1903): 377–385.

Nieuw-Guinea op zijn smalst. Door J. F. Niermeyer. *With Map.*

On the results of a recent journey, by P. E. Moolenburgh, across the neck of land which separates Macluer Gulf from Geelvink bay.

New Zealand. ——

Statistics of the Colony of New Zealand for the year 1901. With Statistics of Local Governing Bodies for the year ended March 31, 1902. Wellington: J. MacKay, 1903. Size 13 × 8, pp. xvi. and 563.

Queensland. **Pugh.**

Pugh's Queensland Almanac and Directory for 1903. Brisbane: Gordon & Gotch. Size 9 × 5½, pp. xl. and 932. *Presented by the Under-Secretary for Queensland.*

Queensland. ——

Queensland. Blue Book for the year 1902. Brisbane, 1903. Size 13½ × 8½, pp. xxxvi. and 244.

Queensland. *Queensland Mining J.* **4** (1903): 105–118.

The Queensland Mining Industry. Review of the year 1902. Report by the Under Secretary for Mines. *With Plans.*

PHYSICAL AND BIOLOGICAL GEOGRAPHY.

Drift-ice. *Ann. Hydrographie* **31** (1903): 204–206. **Schott.**

Die diesjährige grosse Eistrift an der Ostkante der Neufundlandbank. Von Dr. G. Schott. *With Diagram.*

Geomorphology. *Quarterly J. Geolog. S.* **59** (1903): 180–188. **Sollas.**

The Figure of the Earth. By W. J. Sollas. *With Diagrams.*

See note in *Journal* for March, 1903 (p. 326).

Glacial Epoch. *Tijds. K. Ned. Aard. Genoots. Amsterdam* **20** (1903): 386–401. **Lorié.**

De voorgestelde eenheid van het Ijstijdvak. Door Dr. J. Lorié.

Ground-ice. *Verh. Russ.-K. Mineralog. Ges. St. Petersburg* **40** (1902): 203–209. **Bunge.**

Einige Worte zur Bodeneisfrage. Von Dr. A. v. Bunge.

Meteorology. *Meteorolog. Z.* **20** (1903): 218–220. **Hegyfoky.**

Die tägliche Periode der Gewitter im Flach- und in Bergland. Von J. Hegyfoky.

Meteorology. *Meteorolog. Z.* **20** (1903): 193–214. **Margules.**

Ueber Temperaturschwankungen auf hohen Bergen. Von Max Margules.

Meteorology—Dustfalls. *Deutsch. Rundschau G.* **25** (1903): 368–369. ——

Neue Staubfälle aus der Sahara.

Meteorology—Winds. *Monthly Weather Rev.* **31** (1903): 18. **Elmer.**

High winds in mountain valleys. By A. D. Elmer.

Meteorology—Winds. *B.S.G. l'Est* **24** (1903): 5–11. **Millot.**

Les rafales de montagnes. Par C. Millot.

Oceanography. *Ann. G.* **12** (1903): 1–12, 97–108. **Caullery.**

Le Plankton, vie et circulation océaniques. Par M. Caullery.

Oceanography—International Research. *G. Tidskrift* 17 (1903–1904): 49–56. **Ostenfeld.**

De internationale Havundersøgelser. Af C. H. Ostenfeld.

Physical Geography. **Supan.**

Grundzüge der physischen Erdkunde. Von Prof. Dr. A. Supan. Dritte . . . Auflage. Leipzig: Veit & Co., 1903. Size 9½ × 6, pp. x. and 852. *Maps and Illustrations. Presented by the Author.*

Physical Geography—Bibliography. ——

International Catalogue of Scientific Literature. First Annual Issue. J, Geography, Mathematical and Physical. London: Harrison & Sons, 1903. Size 8½ × 5½, pp. 268. *Price* 15*s.*

Phyto-geography. *Naturwissens. Wochenschrift*, N.F. **2** (1903): 325–328. **Graebner.**

Die Vegetationsbedingungen jüngerer und älterer Gehölzpflanzen in der Heide. Von P. Graebner.

Petroleum. **Coste.**

Canadian Mining Institute. The Volcanic Origin of Natural Gas and Petroleum. By E. Coste. Ottawa, 1903. Size 9 × 6, pp. 50. *Presented by the Author.*

Rivers. *Geolog. Mag.* 10 (1903): 145–148. **Davis.**

The Development of River Meanders. By Prof. W. M. Davis.

Rivers—Sudd. ——

The Nile Sudd. (From the *Illustrated Scientific News*, February, 1903, pp. 67–68.) Size 14½ × 10½. *Illustrations.*

Includes, besides four of the illustrations of the Nile Sudd given in the *Journal* for September, 1902, others showing the growth of water-hyacinth on the rivers of Florida.

Sedimentation. *Sci. T.R. Dublin S.* 7 (Ser. ii.) (1902): 391-402. **Joly.**
Some Sedimentation Experiments and Theories. By J. Joly.

Seismology. *A. Travers le Monde, Tour du M.* 9 (1903): 109-111. ———
Vue d'ensemble des Phenomènes volcaniques de 1902. *Map.*

The map shows the probable lines of propagation of the volcanic movements.

Solar Radiation. *P.R.S. Edinburgh* 23 (1899-1901): 296-311. **Knott.**
Solar Radiation and Earth Temperatures. By Prof. C. G. Knott. *With Diagram.*

Terrestrial Magnetism. **Schütz.**
Die Lehre von dem Wesen und den Wanderungen der magnetischen Pole der Erde. Ein Beitrag zur Geschichte der Geophysik. Von Dr. Ernst Harald Schütz. Berlin: D. Reimer (Ernst Vohsen), 1902. Size 10 × 6½, pp. xii. and 76. *Maps and Facsimile.*

Terrestrial Magnetism. *Ann. Club Alpin. Française* 28 (1901): 441-450. **Mathias.**
L'Alpinisme et les études de Magnétisme Terrestre. Par M. E. Mathias.

Terrestrial Physics. *Riv. G. Italiana* 10 (1903): 143-146. **Pagnini.**
L'ipotesi del P. Timoteo Bertelli sulla distribuzione della densità nell' interno della terra. P. Pagnini.

Terrestrial Physics. *Meteorolog. Z.* 20 (1903): 49-53. **Woeikof.**
Problème des Wärmehaushaltes des Erdballs. Von A. Woeikof.

Underground Temperature. *T.R.S. Edinburgh* 40 (1900-1901): 157-186. **Heath.**
Observations of the Edinburgh Rock Thermometers. By T. Heath. *With Diagrams.*

Valleys. *Petermanns M.* 49 (1903): 73-77. **Hess.**
Der Taltrog. Von Prof. Dr. H. Hess. *With Maps and Profiles.*

Volcanoes. **Stübel.**
Ueber die Genetische Verschiedenheit Vulkanischer Berge. Eine Studie zur Wissenschaftlichen Beurtheilung der Ausbrüche auf den Kleinen Antillen im Jahre 1902. Von Alphons Stübel. (Veröffentlichung der Vulkanologischen Abtheilung des Grassi-Museums zu Leipzig.) Leipzig: Max Web, 1903. Size 14 × 11, pp. viii. and 86. *Illustrations. Price* 12*s.*

ANTHROPOGEOGRAPHY AND HISTORICAL GEOGRAPHY.

Anthropology. **Kaindl.**
Die Volkskunde. Ihre Bedeutung, ihre Ziele und ihre Methode. Mit Besonderer Berücksichtigung ihres Verhältnisses zu den Historischen Wissenschaften. Ein Leitfaden zur Einführung in die Volksforschung von Dr. Raimund Friedrich Kaindl. (Die Erdkunde, xvii. Teil.) Leipzig u. Wien: F. Deuticke, 1903. Size 10 × 7, pp. xi. and 150. *Illustrations. Price* 5*s.*

One of a series of treatises on the several branches of geography.

Early Travel. **Dorez.**
Itinéraire de Jérome Maurand d'Antibes à Constantinople (1544). Texte Italien publié pour la première fois avec une Introduction et une Traduction par Leon Dorez. (Recueil de Voyages et de Documents pour servir à l'histoire de la Géographie depuis le xiii^{e} siècle jusqu'a la fin du xvi^{e} siècle, vol. xvii.) Paris: E. Leroux, 1901. Size 11 × 7½, pp. lviii. and 378. *Plates. Price* 30 *fr.*

Historical—British Navy. **Clowes and Others.**
The Royal Navy. A History from the Earliest Times to the Present. By William Laird Clowes. Assisted by Sir Clements Markham, Captain A. T. Mahan, Mr. H. W. Wilson, Colonel Theodore Roosevelt, etc. In 7 vols. Vols. 5, 6, and 7. London: S. Low, Marston & Co., 1900-1903. Size 10½ × 7½, pp. (vol. 5, xx. and 624); (vol. 6, xvi. and 592); (vol. 7, xvi. and 628). *Maps, Plates, and Illustrations, etc. Price* 25*s. net per vol.*

The seventh volume completes the work, which includes valuable discussions by Sir C. Markham on the geographical work done by officers of the Royal Navy.

Historical—Columbus. **Thacher.**
Christopher Columbus. His Life, His Work, His Remains, as revealed by original printed and manuscript records, together with an Essay on Peter Martyr of

Anghera and Bartolomé de las Casas, the First Historians of America. By John Boyd Thacher. Volume i. New York: G. P. Putnam's Sons, 1903. Size 11½ × 8, pp. x. and 670. *Maps, Portraits, and Facsimiles. Price* 36*s. net.*

This sumptuous work will be reviewed when the three volumes are complete.

Historical—Marco Polo. **Yule and Cordier.**

The Book of Ser Marco Polo the Venetian concerning the Kingdoms and Marvels of the East. Translated and edited, with Notes, by Colonel Sir Henry Yule. Third Edition, revised throughout in the light of recent discoveries by Henri Cordier (of Paris). With a Memoir of Henry Yule by his daughter, Amy Frances Yule. In two volumes. London: J. Murray, 1903. Size 9½ × 6, pp. (vol. i.) cii., 144, and 462, (vol. ii.) xxii. and 662. *Maps and Illustrations. Price* £3 3*s. net. Presented by the Publisher.*

BIOGRAPHY.

Grant. **Smith.**

Physician and Friend. Alexander Grant, F.R.C.S. His Autobiography and his Letters from the Marquis of Dalhousie. Edited by George Smith. London: John Murray, 1902. Size 9 × 5½, pp. 218. *Portrait. Price* 10*s.* 6*d. net. Presented by the Author.*

Hugi. **Krehbiel.**

Franz Joseph Hugi in seiner Bedeutung für die Erforschung der Gletscher. Von Albert Krehbiel. (Münchener geographische Studien herausgegeben von S. Günther, Zwölftes Stück.) München: T. Ackermann, 1902. Size 9½ × 6, pp. 92. *Maps.*

See note in Monthly Record (*ante*, p. 219).

Radde. *Alpine J.* **21** (1903): 414–416. **Déchy.**

Dr. Gustav Radde. By M. de Déchy.

Richthofen. *Naturw. Wochenschrift* **2** (1903): 361–370. **Lampe.**

Ferdinand Freiherr von Richthofen. Von Dr. F. Lampe.

Wild. *Deutsch. Rundschau G.* **25** (1903): 375–376. ———

Heinrich v. Wild. *With Portrait.*

GENERAL.

Bibliography. **Baschin.**

Bibliotheca Geographica herausgegeben von der Gesellschaft für Erdkunde zu Berlin, bearbeitet von Otto Baschin. Band viii. Jahrgang 1899. Berlin: W. H. Kühl, 1902. Size 9½ × 6, pp. xvi. and 512.

British Empire. **Wall.**

The British Empire Year Book, 1903. An Annual Statistical Volume of Reference, compiled with the assistance of H.M. Imperial and Colonial Governments, by Edgar G. Wall. First Year of Publication. London, etc.: E. Stanford. Size 10 × 6, pp. viii. and 1280. *Map. Price* 21*s. net. Presented by the Publishers.*

Encyclopædia. **Meyer.**

Meyers Grosses Konversations-Lexikon. Ein Nachschlagewerk des allgemeinen Wissens. Sechste, gänzliche neubearbeitete, und vermehrte Auflage. Dritter Band. Bismarck-Archipel bis Chemnitz. Leipzig u. Wien: Bibliographisches Institut, 1903. Size 10 × 6½, pp. 924. *Maps, Plates, and Illustrations. Price* 10*s.*

Exploration. **Berdrow.**

Prochaskas Illustrierte Jahrbücher. Illustriertes Jahrbuch der Weltreisen und geographischen Forschungen. Von Wilh. Berdrow. II. Jahrgang 1903. Leipzig u. Wien: K. Prochaska. Size 11½ × 8, columns 286. *Price* 1*s.* 6*d. Illustrations.*

Geographical names. **Nagl.**

Geographische Namenkunde. Methodische Anwendung der Namenkundlichen Grundsätze auf das Allgemeiner Zugängliche Topographische Namenmaterial. Von J. W. Nagl. (Die Erdkunde, xviii. Teil.) Leipzig u. Wien: F. Deuticke, 1903. Size 10 × 7, pp. vii. and 136. *Illustrations. Price* 5*s.*

One of a useful series of monographs dealing with the aims and methods of the various branches of geographical science.

NEW MAPS.

By E. A. REEVES, *Map Curator*, R.G.S.

EUROPE.

England and Wales. **Ordnance Survey.**

Ordnance Survey of England and Wales:—Revised sheets published by the Director-General of the Ordnance Survey, Southampton, from June 1 to 30, 1903.

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England and Wales. **Geological Survey.**

Memoirs :—

Cheadle Coal Field, Geology of the. 2*s*.

Reading, Geology of Country around (explanation of sheet 268). 1*s*. 6*d*.

South Wales Coal Field. Part 4, The Geology of the Country around Pontypridd and Maes Têg, being an account of the region comprised in sheet 248 of the map. 1*s*. 6*d*.

Isle of Man, Economic Geology of the, with special reference to the Metalliferous Mines. (Reprinted from the Memoir on the Geology of the Isle of Man, 1903.) 1*s*. 6*d*.

(*E. Stanford, London Agent.*)

ASIA.

Aral Sea. **Petermanns Geographische Mitteilungen.**

Tiefenkarte des Aral-Sees. Nach dem russischen Original reduziert. Scale, 1 : 2,000,000 or 31·5 stat. miles to an inch. *Petermanns Geographische Mitteilungen*, Jahrgang 1903, Tafel 12. Gotha : Justus Perthes. *Presented by the Publisher.*

Central Asia. **Borghese.**

Carta del Tien Scian Centrale con l'itinerario della spedizione del Principe Scipione Borghese (Guigno-Settembre, 1900) Secondo le Note e i Rilievi del Prof. G. Brocherel. Scale 1 : 600,000 or 9·4 stat. miles to an inch. *Presented by Prince Scipione Borghese.*

This map shows the route of the expedition of Prince S. Borghese in the Tian Shan region immediately to the east and south-east of Issik Kul, from June to September, 1900. It is based upon the notes and surveys of Prof. G. Brocherel, who accompanied the prince, and adds considerably to our knowledge of this hitherto very imperfectly explored mountainous district. In addition to the mapping, Prof. Brocherel took an important series of photographs of the region, some of which are now in the Society's collection.

AFRICA.

Morocco. **De Segonzac and de Flotte Roquevaire.**

Itinéraires au Maroc du Marquis de Segonzac. Dressés avec la collaboration de R. de Flotte Roquevaire. Scale 1 : 250,000 or 3·9 stat. miles to an inch. 11 sheets. Paris: Henry Barrère, 1903. *Price* 15 *fr.*

The routes followed by the Marquis de Segonzac's expedition in Morocco extend from Tangier and Melilla on the Mediterranean coast as far south as Ari Aiach in about lat. 30° 30′ N., and from Mogador and Tiznit on the west coast to Marrakesh. These routes are laid down upon eight sheets, in colours, on the 1 : 250,000 scale, in addition to which a considerable amount of detailed information concerning the country traversed is given. The route surveys have been plotted and adjusted with the assistance of Mons. R. de Flotte Roquevaire, the well-known authority on the cartography of Morocco, whose general map of this country is, perhaps, in many respects the best in existence at the present time. In addition to the eight sheets showing the route, there are three others of sections, and inset plans of Tarudant and Tiznit on the scale of 1 : 20,000. It is to be regretted that there is no information on the map concerning the character of the surveys upon which it is based, or how the positions of places have been fixed.

AMERICA.

Argentine Republic. **Smith.**

An Economic Map of the Argentine Republic. Compiled by J. Russell Smith for the *Bulletin of the American Geographical Society*, No. 2, 1903. Scale 1 ; 8,800,000 or 138·8 stat. miles to an inch. *Presented by J. Russell Smith, Esq.*

The small scale of this map, and its style of production, hardly do justice to the most useful information it contains. From an inspection of the table of reference in a corner of the map, it will be seen that an attempt has been made to show, amongst other things, forest land, limits of vine and sugar cultivation, meat freezing and extract establishments, rainfall, limits of wheat-growing territory, political boundaries, railways, and much besides that is very interesting and important from the point of view of commercial geography ; but as a map it is somewhat of a failure, owing to the fact that it has been attempted to show all this information in symbols in black instead of by different colours, and that the scale adopted is much too small for the purpose.

Canada. **Surveyor-General of Canada.**

Sectional Map of Canada. Scale 1 : 190,080 or 3 stat. miles to an inch. Thunder Hill Sheet (29), West of Principal Meridian. Revised to April 21, 1903. Prince Albert Sheet (46), West of Second Meridian. Revised to November 24, 1902. Rush Lake Sheet (51), West of Third Meridian. Revised to April 28, 1903. Brazeau Sheet (86), West of Fifth Meridian. Revised to April 16, 1903. Rainy Hills Sheet (67), West of Fourth Meridian. Revised to March 30, 1903. Surveyor-General's Office, Ottawa, 1903. *Presented by the Surveyor-General of Canada.*

Peru. **Baluarte.**

Map of Peru. Published under the authority of Don Eugenio Larrabure y Unánue, Minister of Foreign Affairs, Lima, 1903. Scale 1 : 3,000,000 or 47·3 stat. miles to an inch. R. E. Baluarte. London: G. Philip & Son. *Presented by Edward Higginson, Esq., Consul of Peru, Southampton.*

An introductory note states that this sheet has been specially produced to make known, in a succinct manner, the inducements which Peru offers for capital, immigration, and colonization. The map shows railways, roads, telegraphs, limit of navigability of rivers, rapids, forests, etc. Upon the back of the sheet is printed useful general information concerning the country and its products.

United States. **Rand, McNally & Co.**

Indexed County and Township Pocket Maps. North Carolina. Scale 1 : 887,040 or 14 stat. miles to an inch. North Dakota. Scale 1 : 1,330,560 or 21 stat. miles to an inch. Ohio. Scale 1 : 823,680 or 13 stat. miles to an inch. Chicago and New York: Rand, McNally & Co., 1903. *Price* $0.25 *each. Presented by the Publishers.*

These are new editions.

POLAR REGIONS.

Greenland. **Engell.**

Karte von Jakobshavns-Eisfjord und die Gletscher-veränderungen. Teilweise nach Rink und Hammer entworfen. Von M. C. Engell. Scale 1 : 200,000 or 3·1 stat. miles to an inch. *Petermanns Geographische Mitteilungen*, Jahrang 1903, Tafel 11. Gotha: Justus Perthes. *Presented by the Publisher.*

GENERAL.

World. **Mackenzie.**

Physical Relief Map of the World on Mercator's Projection, embracing the Physical and Political Features. Reproduced from actual models by an entirely new process by E. A. Mackenzie. Two sheets. London: Effingham Wilson. *Price, in sheets,* £1 1*s*. *Presented by the Publisher.*

This is another attempt to show mountain systems and general relief by photographic reproductions of models, and the result is far from successful, the map being in many respects quite misleading. For instance, the Ural mountains and comparatively insignificant ranges in the northern part of Asia are shown as of equal elevation and importance with the Himalayas, while the great plateau of Tibet and other leading features are not at all clearly brought out. Then, again, in Africa some of the greatest land elevations are shown in comparatively lowlying countries, such as Egypt and the valley of the Nile, whilst lofty peaks, such as Kenia and Kilimanjaro, appear most insignificant.

CHARTS.

North Atlantic Ocean and Mediterranean Sea. **Meteorological Office.**

Pilot Chart of the North Atlantic and Mediterranean for July, 1903. London: Meteorological Office. *Price* 6*d*. *Presented by the Meteorological Office, London.*

United States Chart. **United States Hydrographic Office.**

Pilot Chart of the North Atlantic Ocean for June, and of the North Pacific for July, 1903. U.S. Hydrographic Office, Washington, D.C. *Presented by the U.S. Hydrographic Office.*

PHOTOGRAPHS.

Arabia. **Husain.**

Twenty-four Photographs of Arabia, taken by Vice-Consul Dr. S. M. Husain. *Presented by P. Devey, Esq.*

Mr. G. P. Devey has on several occasions presented photographs to our collection, and these which have lately been received from him, as the titles show, are especially interesting. They are small Kodaks, but most of them are fairly clear.

(1) Egyptian Mahmal (holy carpet) passing through Jeddah; (2) A well on the Jeddah-Mecca road, called "Ummulgurun," near Haddah; (3) Commodore Mustaf Hilmi Bey waiting on the road while his shugduf is being readjusted on the camel; (4) Entrance to Mina, a place 6 miles from Mecca; (5) A street in Mecca; (6) People stoning the big devil at Mina; (7) The Vali stoning the second devil; (8) Grand Sharif stoning the second devil; (9) Crowd of pilgrims stoning the second devil; (10 and 11) Grand Sharif's elephant collecting his toll from the fruit and sweetmeat vendors; (12) Grand Sharif going to see the Pasha of the Syrian Mahmal; (13) Guard of honour in front of the reception tent of the Grand Sharif at Mina; (14) The Vali going to the Grand Sharif's reception; (15) H.H. the Sultan of Zanzibar and his brother-in-law going to the Grand Sharif's reception; (16) Zahir-ul-Islam, son-in-law of the late Shah of Persia, going to the Grand Sharif's reception; (17) Pasha of the Egyptian Mahmal going to the Grand Sharif's reception; (18) An evening party at Mina; (19) An Arab breakfast at Mina; (20) General view of Mina; (21) Arafat camp;

(22) Mount Arafat, on which the Kadi reads sermons on the day of Haj; (23) Pilgrims at Arafat enjoying morning coffee; (24) Two Bedouin shaikhs at Arafat.

Argentine Republic.

An album of twenty-six photographic reproductions of Buenos Aires. *Presented by J. H. Fitz-Simons, Esq.*

An album of twenty-six photographic reproductions of public buildings and places of interest in Buenos Aires. The following are the titles:—

(1) Splendid Hotel; (4 and 21) Plaza de Mayo; (5) The cathedral; (6) Editorial offices of the *La Prensa*; (7) Commercial exchange; (8) Pabellon Argentino; (9) The racecourse; (10) Grand stand on the racecourse; (11) Corn Exchange; (12) Lezama park; (13) The West Railway station; (14) Aguas Corrientes bank; (15) Plaza España; (16) North docks; (17) South docks; (18) Calle Callao; (19 and 20) The new slaughter-house; (22) Entrance to the north harbour; (23) Calle Olivarria; (24) Avenida Alvear; (25) Sarmiento college; (26) Headquarters of the police.

Lofoten Islands—Caucasus—Canadian Rockies. **Woolley.**

Seventeen photographs of the Lofoten islands, Caucasus, and the Canadian Rockies, taken by H. Woolley, Esq. *Presented by H. Woolley, Esq.*

Mr. Hermann Woolley is well known as a mountaineer and photographer of more than ordinary ability, and his excellent views of the high peaks of the Caucasus and Canadian Rocky mountains, etc., have been deservedly admired by all who have seen them. They are enlarged from remarkably good plates, and measure 17½ × 14 inches. Those which have now been presented to the Society are most instructive from a physical geography point of view.

Lofoten Islands.—(1) South end of the Raftsund from Digermulen; (2) South end of the Raftsund with Stor Molla and Lille Molla; (3) Svartsundtind and the Raftsund from Digermulen.

Caucasus.—(1) Ailama; (2) Koshtan Tau and Ulluauz-Bashi; (3) South face of Shkara; (4) South face of Janga and Kalde glacier; (5) Fytnargyn and the Ailama glacier; (6) Freshfield's Latoga; (7) Mountains at the head of the Shikildi glacier; (8) Ushba from the south; (9) Ushba from the south-east; (10) Koshtan Tau.

Canadian Rockies.—(1) Mount Forbes; (2) Hungabee from Desolation valley, Mount Temple group; (3) Mount Athabasca; (4) Moraine lake, Mount Temple group.

Mexico. **Eckenstein.**

Album containing twenty-four photographs of Mexican mountains, taken by O. Eckenstein, Esq. *Presented by O. Eckenstein, Esq.*

Previous to his recent travels in the Himalayas, Mr. Eckenstein visited Mexico and took this excellent little series of photographs of mountain scenery, which he has arranged in an album and presented to the Society:—

(1) Camp on west slopes of Ixtaccihuatl; (2) Ice-cave at a height of about 14,200 feet, on west slopes of Ixtaccihuatl; (3) Cabeza, the north summit of Ixtaccihuatl; (4) Pass between Cabeza and Panza; (5) Panza, the main summit of Ixtaccihuatl, height 17,343 feet; (6 and 7) Ice summit of Panza; (8) Moraine and lower end of Porfirio Diaz glacier, south side of Panza; (9) Popocatapatl, height 17,887 feet; (10) Popocatapatl, from foot of towers; (11) Nevado de Colima, lower summit; (12) Nevado de Colima; (13) Volcan de Colima, about 12,900 feet high; (14–20) Eruption of Volcan de Colima; (21) Xinanticatl, the extinct crater of Toluca; (22) Crater wall and highest summit, Xinanticatl; (23) Crater wall between Espinazo and Fraile, Xinanticatl; (24) Crater wall and second summit, Fraile, Xinanticatl.

Tibetan "Curios." **Millais.**

Photograph of a collection of Tibetan "curios," especially of vessels, instruments, etc., used by the lamas in their monasteries, taken by Geoffrey Millais, Esq. *Presented by Captain E. Le Mesurier.*

N.B.—It would greatly add to the value of the collection of Photographs which has been established in the Map Room, if all the Fellows of the Society who have taken photographs during their travels, would forward copies of them to the Map Curator, by whom they will be acknowledged. Should the donor have purchased the photographs, it will be useful for reference if the name of the photographer and his address are given.

NEAPOLITAN COAST LINE.

GÜNTHER.

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Geographical Journal.

No. 3. SEPTEMBER, 1903. Vol. XXII.

BATHYMETRICAL SURVEY OF THE FRESH-WATER LOCHS OF SCOTLAND.*

Under the Direction of Sir JOHN MURRAY, K.C.B., and LAURENCE PULLAR, F.R.S.E.

INTRODUCTORY.

During the years 1883 and 1884, the Royal Societies of London and Edinburgh urged Her Majesty's Government to undertake a bathymetrical survey of the principal Scottish fresh-water lochs. The Government, however, declined to undertake such a survey, because this work did not fall within the scope of the Ordnance Survey nor of the Hydrographic Department of the Admiralty.† In the years 1897 and 1898, Sir John Murray and the late Mr. Fred. Pullar, F.R.S.E., commenced to sound systematically some of the more important of the Scottish lochs, on the lines indicated in the letter addressed to Her Majesty's Government by the Royal Society of London in the year 1884. The results of these observations were published in the years 1900 and 1901, in two papers dealing with the lochs of the Forth basin and two of the lochs of the Tay basin.‡ Arrangements had been completed for carrying on this survey during the summer of 1901, but the whole work was brought to a standstill by an unfortunate ice-accident in Airthrey loch, near Bridge of Allan, on February 15, 1901, in which Mr. Fred. Pullar lost his life while gallantly endeavouring to save others.§

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* Maps, p. 356.

† This correspondence is published in the *Geographical Journal* (*see* vol. xv. p. 309, 1900) and in the *Scottish Geographical Magazine* (*see* vol. xvi. p. 193, 1900).

‡ "A Bathymetrical Survey of the Fresh-water Lochs of Scotland." Part i. *Geogr. Jour.*, vol. xv. p. 309, *Scott. Geogr. Mag.*, vol. xvi. p. 193, 1900; Part ii. *Geogr. Jour.*, vol. xvii. p. 273, *Scott. Geogr. Mag.*, vol. xvii. p. 113, 1901; Part iii. No. 1, *Geogr. Jour.*, vol. xvii. p. 289, *Scott. Geogr. Mag.*, vol. xvii. p. 169, 1901.

§ See *Geographical Journal*, vol. xvii. p. 313; *Scottish Geographical Magazine*, vol. xvii. p. 148, 1901.

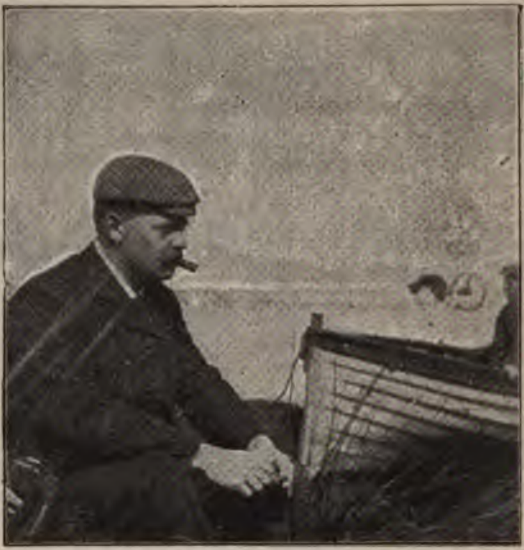

FIG. 1.—THE LATE FRED. P. PULLAR, F.R.S.E.

(From a photograph by Sir John Murray, taken on the shores of Loch Leven, September 1, 1900. Lunch-
on his last sounding expedition.)

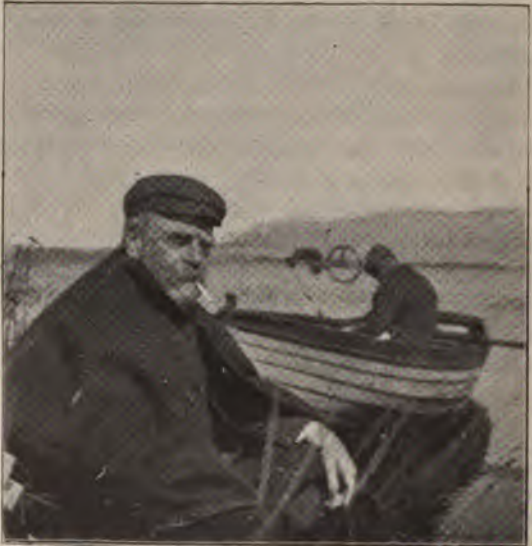

FIG. 2.—SIR JOHN MURRAY, K.C.B.

(From a photograph taken by the late F. P. Pullar, F.R.G.S., during lunch-time on their last soun
expedition together. Loch Leven, September 1, 1900.)

The tragic death of this rising young geographer produced a pro-ind sensation in the community in which he lived and amongst his merous scientific and other friends. Various local memorials have en established to his memory.[*]

Some time after the death of his son, Mr. Laurence Pullar approached r John Murray with regard to the feasibility of continuing and com-eting the work so unfortunately interrupted; he expressed his willing-ess to fill his son's place as far as possible, and, at all events, to set ide a sum of money sufficient to pay for such assistance as Sir John ght desire in carrying on the work and publishing the results. He as even in favour of the scope of the work being extended so as to clude all the inland waters of the United Kingdom, and to embrace ysical and biological observations in addition to the routine sounding ork. Mr. Pullar wished to be assured on two points: *first*, that there as no likelihood of any Government Department carrying out such a rvey; and, *second*, that the work was considered, by competent thorities, important and desirable from a scientific point of view. In ese circumstances the question of the renewal of the survey was bmitted to the Councils of the Royal Societies of London and Edin-rgh. Both Councils passed resolutions stating that they learnt with reat satisfaction that arrangements were under consideration for the mpletion of the survey commenced by Sir John Murray and the late r. F. P. Pullar, and confirmed their opinion as to its great scientific portance. A similar resolution was also passed at the British Associa-n meeting at Glasgow in 1901.[†]

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[*] A volume of press and other public and private references to his death was nted for private circulation, and memorial prizes were given at Stirling High School l in connection with the Marine Biological Association of the West of Scotland, etc.

[†] COPY OF RESOLUTION PASSED BY THE COUNCIL OF THE ROYAL SOCIETY OF LONDON, JUNE, 1901.

Mr. Teall informed the Council that a number of Fellows and others interested in subject had heard a statement by Sir John Murray with reference to a bathymetri-, physical, and biological survey of the fresh-water lakes of Great Britain and land. It appeared that the Council had urged the importance of a bathymetrical rvey of the principal fresh-water lakes of the country in a letter to Her Majesty's vernment, dated May 2, 1884, and that a survey on the lines therein indicated had en commenced, so far as Scotland was concerned, by Sir John Murray and Mr. F. P. llar, but had been unfortunately interrupted by the accidental death of the latter ntleman. Mr. Laurence Pullar (the father of Mr. F. P. Pullar) had now intimated Sir John Murray that he was willing, on certain conditions, to set aside a sum of oney to enable this survey to be completed, and to be extended to all inland bodies water. The conditions were as follows:—

(1) That there was little likelihood of this survey being undertaken by any of the overnment Departments.

(2) That Sir John Murray would himself undertake the general superintendence the survey and the publication of the results.

(3) That, in the opinion of the Council of the Royal Society, it was important from

Although His Majesty's Government could not see its way to undertake a bathymetrical survey of the Scottish fresh-water lochs, still several Public Departments have taken a deep interest in the work and

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a scientific point of view, in addition to the bathymetrical survey recommended in their letter of May 2, 1884, to undertake at the same time an investigation into the physical and biological conditions of the fresh-water lakes.

As soon as the Council had declared their opinion, Sir John Murray was prepared to draw up an approximate estimate of the cost of the work for Mr. Pullar's consideration.

It was resolved—That the Council confirm the opinion expressed in their letter to Her Majesty's Treasury of May 2, 1884, as to the great scientific importance of a bathymetrical survey of the fresh-water lakes of the United Kingdom, and that they have learnt with great satisfaction that arrangements are under consideration for the completion of the survey commenced by Sir John Murray and Mr. Pullar, and are of opinion that the scientific value of the survey will be greatly increased if it embraces a study of the biological and physical conditions of the lakes.

EXTRACT FROM A MINUTE OF MEETING OF THE COUNCIL OF THE ROYAL SOCIETY OF EDINBURGH, HELD ON MAY 24, 1901.

The Council heard a statement from Sir John Murray with reference to a bathymetrical survey of the fresh-water lochs of Scotland to the effect that Mr. Laurence Pullar was willing, on certain conditions, to set aside a sum of money to enable the survey to be completed which had been commenced by Sir John and Mr. Pullar's son, Mr. F. P. Pullar, but which had been interrupted by the unfortunate death of the latter gentleman by accident.

Mr. Pullar was prepared to do this provided Sir John would himself undertake the general superintendence of the survey and the publication of the results; provided, also, that the Council still regarded such a survey as important from a scientific point of view, and that it had been, and was likely in future to be, satisfactorily carried out on the lines suggested by the Council in the year 1884.

Sir John had been requested to prepare an approximate estimate of the cost of completing the survey for Mr. Pullar's consideration, and he now asked the Council for suggestions as to any scientific observations that might with advantage be undertaken in connection with the survey. There was much discussion with regard to researches which might be carried out in fresh-water lochs, and Sir John was asked to assure Mr. Pullar that the Council learned with much satisfaction that arrangements were in contemplation for carrying to a successful completion the admirable survey which had been commenced by Sir John and Mr. Pullar's son, Mr. F. P. Pullar, who was a member of the Society, and whose death they all deplored.

At the meeting of the British Association in Glasgow in September, 1901, the President of the Geographical Section (Dr. H. R. Mill) was enabled to announce that definite arrangements had been made to carry on the work; a conference of the Geographical, Geological, and Zoological Sections was held on September 16, 1901, for the purpose of considering the scheme of the survey; the discussion was taken part in by Dr. Mill, Prof. Bonney, Dr. John Horne, Mr. Isaac Thompson, Colonel Johnston, Mr. Ben. N. Peach, Mr. R. M. Clark, Prof. Watts, Mr. Barrow, Mr. Cunningham Craig, Mr. Dickson, Dr. Fullarton, Mr. W. S. Bruce, Mr. Greenly, and the Rev. Frank Knight, and many valuable suggestions were thrown out as to the scope of the work. At the conclusion of the discussion, Dr. Horne formally moved, on behalf of the meeting, the great gratification they all felt that this investigation should be carried out by means of the munificence of Mr. Pullar, and under the administration of Sir John Murray; the resolution was seconded by Mr. Peach, and unanimously adopted.

have given important assistance. A letter was received from Colonel Duncan A. Johnston, R.E., Director-General of the Ordnance Survey, stating that the Board of Agriculture had sanctioned the issue to the staff of the survey of two copies of the 6-inch and one copy of the 1-inch maps of the districts in which lakes were situated, one copy of the former to be returned to the department with the depths of the lakes laid down on it, with a view to the lake-contours being shown on the Ordnance Survey maps. T. Digby Piggott, Esq., C.B., Controller of His Majesty's Stationery Office, wrote to the effect that no objection would be raised by his department, on the ground of copyright, to the reproduction of Ordnance Survey maps, and publication if desired, in connection with the Lake Survey, on the understanding that the source from which the reproductions are taken is quoted, and due acknowledgment be made of the fact that the consent of the Controller had been obtained. Admiral Sir W. J. L. Wharton, K.C.B., F.R.S., Hydrographer of the Admiralty, also promised the advice and assistance of his department. Through Mr. J. J. H. Teall, F.R.S., Director-General of the Geological Survey, and Dr. John Horne, F.R.S., Director of the Geological Survey of Scotland, Sir John Murray was informed that the Board of Education had sanctioned the issue to the Lake Survey staff of a complete set of the Geological Survey maps of Scotland, and, in addition, had sanctioned the supply of information which might be asked for by the staff of the Lake Survey during the course of their investigations. This latter privilege has been very largely taken advantage of, and Dr. Horne and

-SO HE BRINGETH THEM VNTO THEIR DESIRED HAVEN-

FIG. 3.—MEMORIAL BRONZE TO F. P. PULLAR, BY G. A. FRAMPTON, R.A., ERECTED IN LOGIE CHURCHYARD, BRIDGE OF ALLAN.

In the central group the hero is shown supported by angel figures, whose wings form a canopy and throw shadows symbolical of the mystery beyond; in front walk heralds carrying a laurel wreath, and behind others playing musical instruments. The legend is, "So He bringeth them unto their desired haven."

the other members of the Geological Survey in Scotland have rendered continuous advice and assistance, and have now given directions for the preparation of maps and notes concerning the surface geology of some of the areas in which the lakes are situated. These maps and notes will form a valuable part of the forthcoming publications.

All plans for carrying on the work having matured during the winter of 1901–2, a staff was appointed, and a start was made early in the spring of 1902, in the lochs situated in the more northerly part of the Tay basin, the survey being gradually extended to the lochs northwards of this region.*

During the summer of 1902, about 155 lochs were sounded, and the work has been continued during the present summer, over 300 lochs having now (July) been surveyed. It is, indeed, expected that the survey of all the lochs of the mainland of Scotland, together with those of the Outer Hebrides, Orkney, and Shetland, will be completed this year. As a rule, those lochs on which there are now no rowing-boats, or to which boats could not easily be transported, have been omitted in the meantime.

The methods employed in conducting these recent bathymetrical surveys have been essentially the same as those described in the paper communicated to the *Geographical Journal* in 1900.† The F. P. Pullar sounding-machine (see Fig. 4) has been used in all the larger lochs, but for the smaller lochs situated high up on the hills or otherwise difficult of access, several small machines (see Fig. 5) were constructed, which could be carried in the hand and easily fixed to the side of the rowing-boat. The line used was marked in feet in the usual way, and although the soundings took a much longer time, this small machine proved most satisfactory for hill lakes.

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* Mr. T. N. Johnston, M.B., C.M. (Edin.), F.R.S.E., was appointed first assistant and zoologist; Mr. James Parsons, B.SC. (Lond.), chemist; Mr. James Murray, assistant zoologist; Mr. T. R. H. Garrett, B.A., Jesus College, Cambridge, geologist; Mr. John Hewitt, B.A., Jesus College, Cambridge, zoologist; Mr. James Chumley, secretary, assisted by Mr. Robert Dykes, in charge of office work. Mr. R. M. Clark, B.SC., Aberdeen, also devoted a large part of the summer to field-work in connection with the survey, and assistance was also given for short periods by Dr. J. Sutherland Black, M.A., F.R.S.E., Sir John Jackson, LL.D., Mr. D. C. McIntosh, M.A., Mr. James Walker, C.E., and Mr. D. J. Scourfield.

During the last winter Mr. Parsons was appointed to a post on the Mineralogical Survey of Ceylon, and Mr. Garrett was appointed geologist to an East Borneo company. Their places on the staff have been taken by Mr. R. B. Young, M.A., and Mr. R. Marshall, M.A. In the summer of 1903 Mr. E. M. Wedderburn joined the staff, and also Mr. E. R. Watson, B.A., B.SC., Jesus College, Cambridge, and Mr. Scourfield and oth have rendered assistance. Among the boatmen who have been employed, Mr. Hu Drummond deserves to be mentioned, as he has been continuously employed since t spring of 1902, and this summer Mr. Allan Grant and Mr. William Fraser have be continuously in the service of the Lake Survey. In June Mr. Young was appoint to a post in the South African College, and his place on the staff was taken Mr. J. H. M. Wedderburn, M.A., F.R.S.E. During the present summer (1903) the sta numbers about fifteen in all.

† *Geogr. Jour.*, vol. XV. p. 311.

The 6-inch Ordnance Survey maps, supplied to the staff by the Ordnance Survey Office, have been used throughout, both in the field and office work. The positions of all the soundings were originally laid down on these maps. Tracings were then made on cloth, and the corrected soundings neatly written in at the correct positions, and the contour-lines of depth drawn. The areas within the various contour-lines were then ascertained by means of the planimeter, and the total bulk of water in the basin calculated from the data thus obtained. The maps to be published with this and succeeding papers are reduced to the scale of 3 inches to 1 mile (1 : 21,120). The soundings are given in feet; in some cases it was not possible to place all the soundings taken by the staff on the maps, because of their being too close together. The intervals between the contour-lines of depth are tinted with deepening shades of blue, the darkest shades indicating the greatest depths. The orographical relief of the loch basins has also been shown by contour-lines tinted with shades of brown, the darkening brown indicating the elevations. Longitudinal and cross-sections of the depths have been drawn for each loch. On these sections the black line of varying thickness along the top represents the true vertical relief drawn to scale, while the coloured extensions in outline represent the vertical scale five times exaggerated, in order to show the relative depth with greater effect.

The maps have been prepared under the direct superintendence of Mr. J. G. Bartholomew, F.R.S.E., who has taken great interest in the work, and has suggested lines of useful investigation. When the results of each river-basin are published, the tracings of the 6-inch maps above referred to, with the soundings on them, will be placed in the hands of the Director-General of the Ordnance Survey for preservation and future reference.

The late Sir Robert Menzies, the Marquis of Breadalbane, Sir John Stirling Maxwell, Donald Cameron, Esq., of Lochiel, Charles Murray, Esq., M.P., of Lochcarron, Lord Lovat, Sir John Ramsden, Sir Kenneth MacKenzie, H. C. Ross, Esq., Lord Zetland, and many other Highland proprietors, have taken great interest in the work of the survey. They have materially assisted, by the loan of boats and in other ways, in the progress of the survey; indeed, without their aid the amount of work reported above could not have been carried through.*

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* Proprietors and others interested in the work of the Lake Survey, and desirous of possessing for their own use 6-inch maps of any of the lochs surveyed, with the soundings and contour-lines of depth laid down in position, can be supplied with copies on payment of the cost of the maps and of the office labour involved in transferring the data. Application should be made to Mr. James Chumley, Secretary of the Lake Survey, Challenger Office, 45, Frederick Street, Edinburgh.

A limnograph constructed after the designs of M. Ed. Sarasin, of Geneva, has been erected in the grounds of the St. Benedict's monastery at Fort Augustus, by the kind permission of the Lord Abbot, and is under the charge of Mr. E. M. Wedderburn. Up to the time of writing, Mr. Wedderburn reports that since June 18 the instrument has been continuously recording the rise and fall in the waters of Loch Ness. He has been able to recognize uninodal, binodal, quadrinodal, as well as transverse seiches. Several observations have been made at various points on the shore by means of the plemyrameter, and it is hoped in this way to determine the position of the nodes.

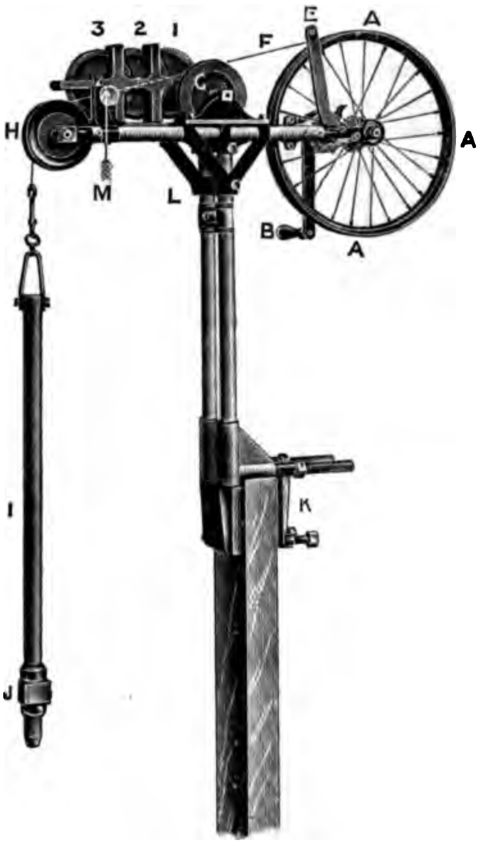

FIG. 4.—THE F. P. PULLAR SOUNDING-MACHINE.

Under the direction of Prof. Callendar, F.R.S., and Mr. Horace Darwin, F.R.S., instruments have been constructed, and are being erected at Fort Augustus by Mr. E. R. Watson, to carry out—

(*a*) Observations on the *daily variations of temperature* of the waters, by means of a series of platinum resistance thermometers (and Callendar's bolometers), with a view to obtaining, among other things—

(1) A measure of the amount of energy passing per day across unit area of the lake's surface.

(2) Some knowledge of the mechanism by which the water, especially in the deeper layers, is heated up and cooled off.

(*b*) Observations on the rate of leak of an electrically charged body on insulating supports in a vessel sunk to different depths, to ascertain—

(1) If water absorbs such radiations as effect the ionization of gases.

(2) If the deep waters are themselves radio-active.

(*c*) Observations on the limiting depth for visibility of a painted disc, and the relation between this depth and the zenith distance of the sun, the amount of organisms and of inorganic matter in the water, the temperature of the water, etc.

A number of biologists are now stationed at Fort Augustus, carrying out observations on the planktonic and benthonic organisms in the waters of Loch Ness, at the same time and place as the above-mentioned physical observations. It is thought that some insight may in this way be obtained into the interpretation of the varying physical conditions and the habits of the organisms.

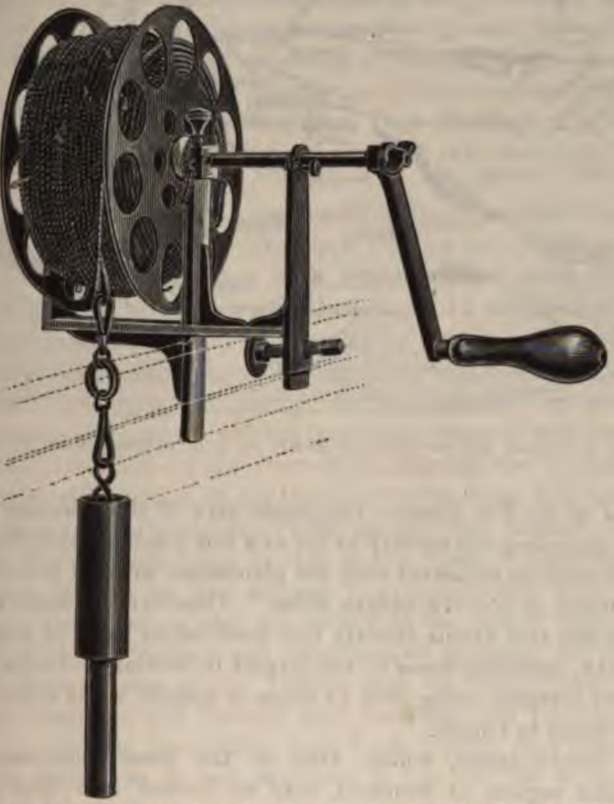

FIG. 5.—SMALL SOUNDING-MACHINE FOR USE IN SMALL AND SHALLOW LOCHS.

Arrangements have been made for the publication of the bathymetrical maps and the other observations of the Lake Survey staff in the *Geographical Journal*, the present communication being the first of the new series. It deals with a number of the lochs towards the head-waters of the main branches of the Tay basin. In addition to the maps, the paper is illustrated by photographs taken by the members of the staff and others.* It is hoped that the whole will, when completed, form a worthy memorial of the late Mr. F. P. Pullar, F.R.S.E.

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* Sir John Murray would be greatly indebted to amateur photographers for copies of any photographs of the Scottish fresh-water lochs, with a view to their reproduction

Part III.—Lochs of the Tay Basin.

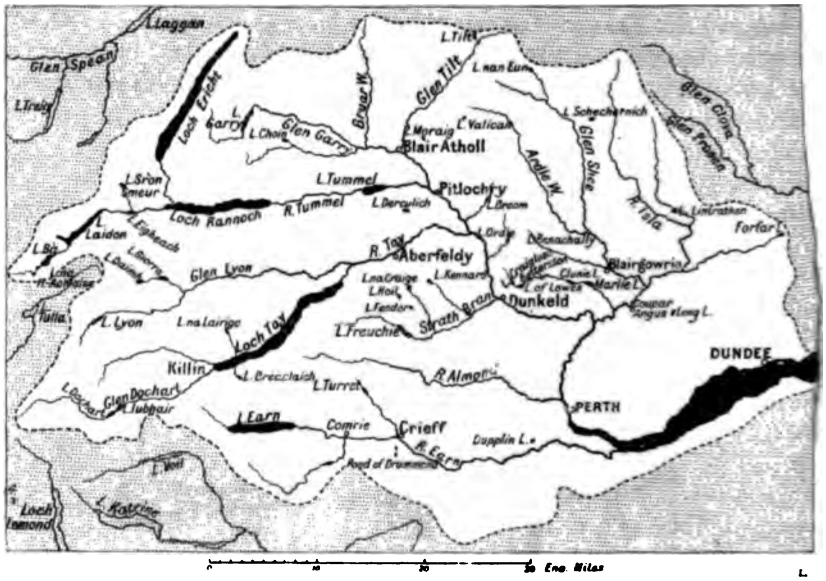

FIG. 6.—INDEX MAP OF THE TAY BASIN, BY J. G. BARTHOLOMEW, F.R.G.S.

Extent of the Tay Basin.—The whole area of the drainage basin of the Tay, including the estuary as far as a line joining Tents Muir Point with Monifieth, as measured with the planimeter on the 1-inch Ordnance Survey maps, is 2509·73 square miles.* Considerably more than one-fourth of this area drains directly into fresh-water lochs, of which there are seventy, including some of the largest in Scotland—Lochs Tay and Ericht, for instance, being over 14 miles in length, while eight of them exceed 2 miles in length.

The river-systems, which arise in the most mountainous and magnificent regions of Scotland, may be divided into four principal branches, viz. the Garry branch (the most northerly), the Tummel branch, the Tay branch, and the Earn branch (the most southerly).

(1) The Garry branch rises on the flanks of Beinn Mholach, Beinn

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in the publications of the survey. Any selected for this purpose will be duly acknowledged. The copies of the photographs may be forwarded to Mr. James Chumley, Secretary of the Lake Survey, Challenger Office, 45, Frederick Street, Edinburgh.

* Geikie ('An Elementary Geography of the British Islands,' London, 1888, p. 86) gives the drainage basin of the Tay as 2250 square miles, and Lawson ('The Geography of River Systems,' London, N.D., p. 6) as 2400 [square] miles. According to Geikie, the Tay pours a larger volume of water into the sea than any other British river, and its drainage area is the largest in Scotland, and seventh in point of size in the British Islands, being exceeded by that of the Shannon in Ireland, the Thames, Severn, Ouse, Trent, and Great Ouse in England.

Bhoidheach, and Carn Beag an Laoigh, flowing by various streams into Loch Garry, thence by the river Garry into the river Tummel at Faskally, to the north-west of Pitlochry, receiving the waters of the Errochy at Struan, and those of the Tilt at Blair Atholl.

(2) The Tummel branch rises in the Black Mount, the westernmost of the sources of the Tay river-systems, flowing by the river Bà into Loch Buidhe, Lochan na Stainge, and Loch Bà, which receives the outflow from Lochan na h-Achlaise, thence flowing into Loch Laidon, thence into Loch Eigheach—an expansion of the river Gaur—receiving the waters from Lochan Sròn Smeur, and then flowing into Loch Rannoch, which receives the outflow from Loch Ericht, flowing finally into Loch Tummel, thence by the river Tummel into the river Tay at Logierait.

(3) The Tay branch rises on the flanks of Ben Lui (Beinn Laoigh), and flows by the river Fillan into Loch Dochart and Loch Iubhair, thence by the river Dochart into Loch Tay, being joined by the river Lochay at Killin just before entering Loch Tay; the outflow from Loch Tay is carried into the estuary of the Tay by the river Tay, which is joined shortly after leaving Loch Tay by the river Lyon, bearing the outflow from Loch Lyon, and further on (at Logierait) by the river Tummel, bearing the outflow from the Garry and Tummel branches, still further on (at Dunkeld) by the river Bran, bearing the outflow from Loch Freuchie, still further on (at Cargill) by the river Isla, and still further on, shortly before reaching Perth, by the river Almond.

(4) The Earn branch takes its rise at the heads of Glen Ogle and Gleann Ceann Droma, the two streams flowing into the west end of Loch Earn, which receives also the waters of the Ample burn, Beich burn, the Vorlich, the Tarken, and other smaller streams; the outflow from Loch Earn passes at St. Fillans into the river Earn, which receives the waters of the Ruchill and Lednock near Comrie, those of the Turret bearing the outflow from Loch Turret, near Crieff, and other smaller streams as it flows eastward to join the Tay at the head of the estuary.

In this and the next succeeding paper it is proposed to deal with the results obtained by the Lake Survey in the lochs of the Tay basin. The bathymetrical results will be given in detail in the first instance, and in the last paper on the Tay basin lochs the general biological and physical results will be given, together with a description of the geological character of the upper parts of the basin by Dr. John Horne, F.R.S., of the Scottish Geological Survey.

MAPS AND ILLUSTRATIONS.

The maps illustrating this paper are reduced from the 6-inch Ordnance Survey charts, and are published by permission of the Controller of H.M. Stationery Office.

Plate I. shows Loch Bà, Lochan na h-Achlaise, Lochan na Stainge, and Loch Buidhe, the contour-lines of depth being drawn in at 10 and 20 feet.

Plate II. shows Loch Laidon with Dubh Lochan, the contour-lines of depth being drawn in at 25, 50, 75, 100, and 125 feet.

Plate III. shows Lochan Sròn Smeur and Loch Eigheach, the contour-lines of depth being drawn in at 10 and 20 feet.

Plate IV. shows Loch Rannoch, the contour-lines of depth being drawn in at 50, 100, 200, 300, and 400 feet.

Plate V. shows Lochs Dochart and Iubhair, the contour-lines of depth being drawn in at 25 and 50 feet.

Plate VI. shows Loch Lyon, the contour-lines of depth being drawn in at 25, 50, 75, and 100 feet.

Plate VII. shows Loch Earn, the contour-lines of depth being drawn in at 50, 100, 200, and 250 feet.

In addition to the maps, there are fourteen woodcuts in the text; eight illustrating the character of the scenery around the lochs, another showing the Tay basin on a small scale, intended to serve as an index map, two others giving photographs of Sir John Murray and the late Mr. Fred. Pullar, taken during their last sounding trip together, another giving a photograph of bronze tablet in memorial to the late Mr. Pullar, another showing the F. P. Pullar sounding machine, and another showing new small sounding-machine for use in surveying small and shallow lochs.

1. *Lochs Ericht and Garry.*

These two lochs were sounded by Sir John Murray and the late Mr. Fred. Pullar in the spring of 1900, and the results were published in the *Geographical Journal* in March, 1901.*

2. *Rannoch Moor Lochs.*

No coach road in Britain probably passes through more magnificent scenery than that between the Bridge of Orchy and Ballachulish. About halfway between Inveroran Hotel and King's House Hotel the river Bà crosses the road, and to the west lies Corrie Bà, the sanctuary of the Black Mount forest, where no shot is ever fired, and consequently this splendid corrie is the home of the deer, the golden eagle, the fox, and other wild animals. Here also is the most westerly sources of the rivers of the Tay basin. In rainy weather a large amount of water passes down the river Bà and other streams into the Moor of Rannoch, and about a mile or two to the eastward of the road a large extent of the moor is flooded, and presents the appearance of a vast lake. In drier weather there are distinct basins, which have received the names of Loch Buidhe, Lochan na Stainge, Lochan na h-Achlaise, and Loch Bà (or A-baw), all of them situated in drift and encumbered with rocks

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* *Geographical Journal*, vol. xvii. p. 289.

*Lochan na Stainge.**—Lochan na Stainge (or na-Sting) is extremely irregular in outline, and includes three comparatively large islands as well as a number of small ones. Its length from north to south is over half a mile, the maximum breadth being two-fifths of a mile, and the mean breadth about one-seventh of a mile. Its waters cover an area of over 51 acres, or rather more than one-twelfth of a square mile, and it drains directly about two-thirds of a square mile, but since it receives the outflow from Loch Buidhe its total drainage area is nearly 12 square miles, or 147 times the area of the loch. The loch is divided into two portions by a barrier at the central constriction, on which there is only 1 foot of water, the maximum depth observed in the northern portion (between the large island and the northern shore) being 8 feet, while the maximum depth of the loch (14 feet) was found in the southern portion immediately to the south of the barrier referred to. The volume of water contained in the loch is estimated at 11,407,000 cubic feet, and the mean depth at 5 feet. The loch is on the whole shallow, nearly 99 per cent. of its floor being covered by less than 10 feet of water. It was surveyed on April 19, 1902, by Sir John Murray and Dr. Johnston, fifty-five soundings being recorded. The level of the loch was not determined by levelling, but on the new edition of the Ordnance Survey map (1897) there is a spot-level of 972 feet on the southern shore near the inflow, and another of 968 feet on the northern shore at the outflow, so that the surface of the water is probably about 970 feet above the sea. The drift-marks around the loch showed that it sometimes rises 5 feet higher than on the date surveyed, and during floods the whole valley looks like one loch, with knolls projecting above the water. The temperature of the surface water at 10.30 a.m. on April 19, 1902, near the boathouse, was 43°, and on returning to the same place at 12.30 (noon) it had risen to 46°·4; in the main basin, near the centre, the surface temperature was 42°·6, while the temperature of the air was 49°.

Lochan na h-Achlaise.†—Lochan na h-Achlaise (or na-Hachlich) is irregular in form, the outline being somewhat triangular or heart-shaped, with the apex pointing south. It includes many larger and smaller islands, and the bottom in the shallower places is covered by stones and boulders. The length from north to south is over four-fifths of a mile, while the maximum breadth from east to west is about three-quarters of a mile, the mean breadth being over one-third of a mile. Its waters cover an area of about 183 acres, or nearly three-tenths of square mile, and it drains an area of over one square mile, or nearly four times the area of the loch. The north-western portion of the loch is shallow, the deeper water being found in the southern and eastern portions. The 10-feet basin is a continuous area, extending from near the southern shore in a northerly and then north-easterly direction to near the north-eastern shore, excluding the islands lying off the eastern shore, and is nearly three-quarters of a mile in length. The 10-feet basin includes two 20-feet basins, the more southerly being the larger and deeper, the maximum depth of the loch (28 feet) having been found towards the north-eastern end of this basin, and comparatively close to the eastern shore. The volume of water contained in the loch is estimated at 76,236,000 cubic feet, and the mean depth at 9½ feet. The loch is on the whole comparatively shallow, about 63 per cent. of the bottom being covered by less than 10 feet of water, while only 9 per cent. of the bottom is covered by over 20 feet of water. The loch was surveyed on April 16, 1902, by Messrs. Parsons, Clark, and McIntosh, over one hundred soundings being recorded. The surface of the water was found to be 962 feet above sea-level by the officers of the Ordnance Survey in 1897. The temperature of the surface water at 6 p.m. on April 16, 1902, was 45°·2.

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* = Loch of the Stank or Fold. † = Loch in the Hollow.

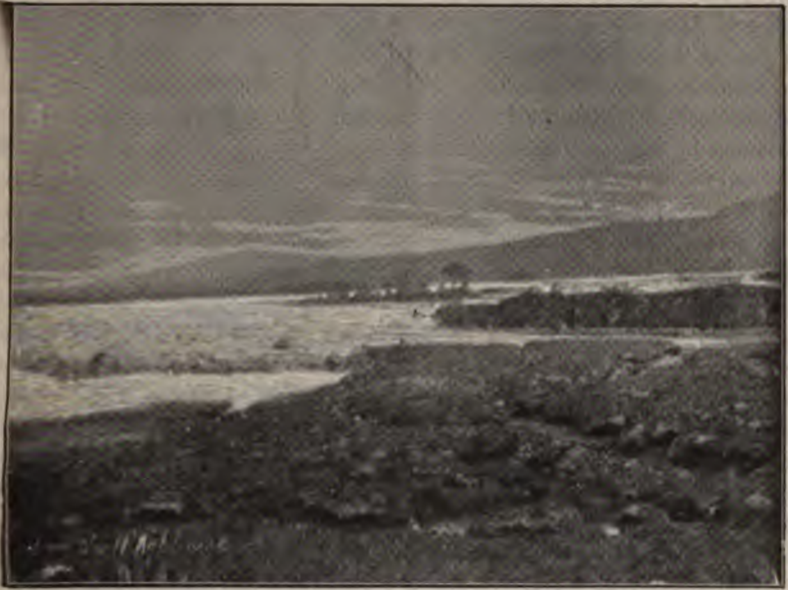

FIG. 8.—LOCHAN NA H-ACHLAISE.
(*Photo by R. M. Clark, B.Sc.*)

*Loch Bà.**—Loch Bà (or A-baw) is extremely irregular in outline, studded with large and small islands, and with many rocks and boulders. Its length from south-west to north-east in a straight line is over 2 miles, and following the axis of deep water about 2½ miles. Its maximum breadth in the southern portion from east to west is over a mile, and the mean breadth is nearly half a mile. Its waters cover an area of about 585 acres, or nine-tenths of a square mile, and it drains directly an area of 4½ square miles, but since it receives the outflow from Loch Buidhe, Lochan na Stainge, and Lochan na h-Achlaise, its total drainage area is nearly 17½ square miles, or nineteen times the area of the loch.

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* = Cow loch.

The bottom of Loch Bà is very irregular. The deepest water occurs in the northern portion between the islands of Eilean Molach and Eilean na h-Iolaire, where there is a small basin less than a quarter of a mile in length and over 20 feet in depth, the maximum depth of 30 feet having been observed about one-sixth of a mile to the north of the northern point of Eilean Molach. An isolated sounding of 20 feet was taken close to the western shore of the southern portion of Eilean Molach. There are three irregular basins with depths exceeding 10 feet: the central one, enclosing the 20-feet basin, and extending on both sides of Eilean Molach and to the west and north of Eilean na h-Iolaire, is nearly three-quarters of a mile in length and over a quarter of a mile in breadth; the southern one, occupying the wide south-eastern portion of the loch, is nearly half a mile in maximum diameter; and the third, situated in the north-eastern extension of the loch, is nearly half a mile in length and nearly a quarter of a mile in breadth. The volume of water contained in the loch is estimated at 206,497,000 cubic feet, and the mean depth at 8 feet, being 27 per cent. of the maximum depth. The length of the loch is 378 times the maximum depth and 1402 times the mean depth. Over 70 per cent. of the floor of the loch is covered by less than 10 feet of water, and only 1½ per cent. by more than 20 feet of water. The loch was surveyed on April 17 and 18, 1902, by Sir John Murray and Dr. Johnston, over three hundred soundings having been taken. The level of the loch was determined by the Ordnance Survey officers in 1897 as being 957 feet above sea-level. The temperature of the surface water near the boathouse, when commencing the survey at 2.45 p.m. on April 17, was 50°·8 Fahr., but later, out in the open water, the surface temperature was 44°·2 Fahr.; on the 18th at noon the surface temperature near the shore was 50°·0 Fahr. (the air-temperature at the time being 50°·4 Fahr.), while in the bay to the north of the boathouse the temperature was 46°·0 Fahr.

Lochan Beinn Caorach* and some other small basins of water in this region were without boats and could not be sounded; they were evidently all quite shallow and of the same character as Loch Buidhe.

Loch Laidon.†—Loch Laidon (or Lydoch, or Luydan) lies partly in Perthshire and partly in Argyllshire, the boundary running along the centre of the western arm and for a certain distance up the main loch. It is one of the best trouting lochs in the district, or perhaps in Scotland. It is about 5⅓ miles in length from north-east to south-west, but it sends out an arm towards the west, which is over 1¼ miles in length, and a line following the axis of the loch from the north-east end to the extremity of the western arm would be over 6 miles in length. Its maximum breadth is nearly three-quarters of a mile, and the mean breadth about one-third of a mile, or 6·4 per cent. of the length. Its waters cover an area of about 1149 acres, or over 1¾ square miles, and it drains directly an area of 30¼ square miles; but, since it receives the outflow from Lochs Bà, Achlaise, Stainge, and Buidhe, its total drainage area is over 47½ square miles, or 26½ times the area of the loch. Nearly five hundred soundings were taken in the loch, and the maximum depth observed was 128 feet, the mean depth being 35 feet, or 27½ per cent. of the maximum depth. The length of the loch is 219 times the maximum depth, and 795 times the mean depth. The volume of water contained in the loch is estimated at 1,761,733,000 cubic feet. The western extension and the southern end of Loch Laidon are filled with boulders and islets, and are like Loch Bà in character, but the main basin is of comparatively simple form, though with minor undulations of the lake-floor, the deepest water occupying the centre of the loch, where there is a basin three-quarters of a mile in length and

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* = Loch of the Slopes. † = Loch of the Sheep-hill.

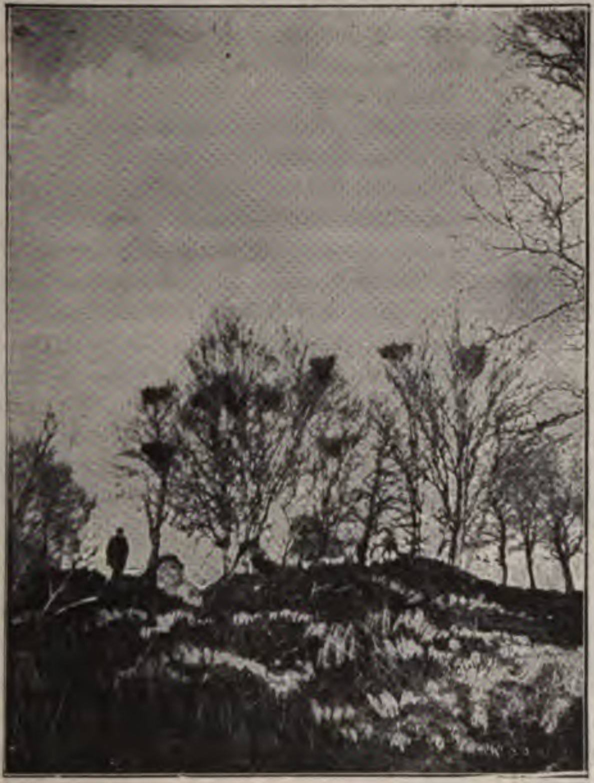

FIG. 9.—HERONS' NESTS ON EILEAN MOLACH IN LOCH BÀ.
(*Photo by T. N. Johnston, M.B., C.M., F.R.S.E.*)

over 100 feet in depth, the maximum depth of 128 feet having been observed about 2¾ miles from the south-west end and 2½ miles from the north-east end. Separated from this main 100-feet basin by shallower water, there is a sounding of 104 feet a short distance to the south-west, and half a mile further south there is an isolated sounding of 100 feet; there is also an isolated sounding of 100 feet a quarter of a mile to the north-east of the main basin. The principal 50-feet basin extends from less than a mile from the south-west end to less than 1½ miles from the north-east end, and is nearly 3 miles in length. Separated from this larger basin by an interval of a quarter of a mile is a smaller one, about one-third of a mile in length, situated in the north-eastern part of the loch, and nearly midway between them is an isolated sounding of 50 feet. The western arm of Loch Laidon is shallow and filled with rocks and boulders, the greatest depth observed being 17 feet in three different places. Of the entire lake-floor, 53 per cent. is covered by less than 25 feet of water, 21 per cent. is covered by water between 25 and 50 feet in depth, 22 per cent. by water between 50 and 100 feet in depth, and 4 per cent. by water exceeding 100 feet in depth. Loch Laidon was surveyed on April 9 to 25, 1902, by Sir John Murray, Dr. Johnston, Messrs. Parsons, Clark, and McIntosh, and the surface of the loch was found by levelling to be 923·9 feet above sea-level. When surveyed by the Ordnance Survey officers on July 28, 1860, the level of the loch was 924·6 feet above the sea. At the north-eastern end of Loch Laidon is a small basin called Dubh Lochan,* which was found by levelling on April 14, 1902, to be 2 feet higher than Loch Laidon, and should, therefore, strictly speaking, be looked upon as a distinct lake, but in the foregoing description the two lakes have been regarded as one. Many temperature observations were taken in Loch Laidon on April 9, 10, 14, 15, and 25, the surface readings varying from 38°·8 at 5 p.m. on the 9th to 48°·2 at the head of the loch at 1 p.m. on the 10th—a range of 9°·6 in the temperature of the water, while the range in the air-temperature during the same period was only 5° (from 45°·2 to 50°·2). Two serial temperature observations were taken in the centre of the loch, the first at 5 p.m. on April 9, when the readings were identical (39°·8) at the surface and at depths of 5 and 25 feet, the second at 5.20 p.m. on the 10th, when the surface readings were 39°·8 and 41°, that at 5 feet 39°·7, and that at 20 feet 39°·4. The surface temperature in Dubh Lochan on April 14 was 43°·9.

The western arm of Loch Laidon receives the waters from a small loch (Lochan Gaineamhach)† lying about 2 miles to the west. This loch, and the neighbouring one to the north, were visited on May 20, 1903, but, as there were no boats on them, they were not sounded. They were found to be of the same general character as the other twelfth of a square mile), and it drains an area of nearly 2 square miles, nearly twenty-four times the area of the loch. It was surveyed on May 12, 1902, by Sir John Murray and Mr. James Murray, who took about seventy soundings, the maximum depth observed being 33 feet. The volume of water contained in the lake is estimated at 22,592,000 cubic feet, and the mean depth at 10·3 feet, or 31 per cent. of the maximum depth. The loch is of simple conformation, the western half being comparatively shallow, while the deeper water occurs in the eastern half, the maximum depth having been found about one-eighth of a mile from the eastern end. The 10-feet basin approaches quite close to the eastern shore, and is about one-third of a mile in length, enclosing the 20-feet basin, which is about one-fifth of a mile in length. About 61 per cent. of the lake-floor is covered by less than 10 feet of water, while about 12 per cent. is covered by over 20 feet of water. No bench-marks were found near the loch, but a little distance up the river which feeds it there is a spot-level of 1134 feet. There was little evidence of much rise and fall in the level of the water, the range possibly not exceeding 2 feet. The temperature of the surface water varied from 47°·4 to 50°·5, a range of 3°·1, the higher readings being taken in shallow water near shore. Readings at 10 feet and at 20 feet near the centre of the loch gave 48° in each case, the surface temperature at the same time being 47°·6.

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* = Black Lochan. † = Loch of sandy beaches.

Less than a mile to the east of Lochan Sròn Smeur is Lochan Lòin nan Donnlaich* (or Lochan Lòin nan Dubhach, or Loch-an-Londonich), said to contain large trout. When visited, many rocks and boulders were observed showing above the water, and grass filled the bay at the outlet.

Loch Eigheach.†—Loch Eigheach (or Eaigh), about 3 miles from where the river Gaur passes its waters into Loch Rannoch, is an expansion, or rather three expansions, of the river Gaur, the two western expansions lying on a higher level than the eastern one, and hence strong currents run in an easterly direction. In high floods the whole area is practically submerged. A large part of the loch is covered by reeds, and the bottom is very weedy. The entire loch is nearly nine-tenths of a mile in length, with a maximum breadth of less than a quarter of a mile, the mean breadth being one-tenth of a mile. Its waters cover an area of about 59½ acres, or less than one-tenth of a square mile, and it drains directly an area of nearly 14 square miles, but since it receives the outflow from Lochan Sròn Smeur and from Lochs Laidon and Bà, etc., its total drainage area is nearly 63½ square miles, or 705 times the area of the loch. The loch was surveyed by Dr. Johnston on April 21, 1902, about eighty soundings being recorded, the maximum depth observed being 28 feet. The surface of the eastern expansion was found by levelling to be 81[illegible]-2 feet above sea-level, and the water apparently rises about 3½ feet above its level on the date surveyed. The volume of water contained in the loch is estimated at 15,794,000 cubic feet, and the mean depth at 6 feet, or 22 per cent. of the maximum depth. The eastern expansion is the deepest, the maximum depth of 28 feet having been found to the west of the island near the east end of this expansion; the north-western expansion has a maximum depth of 7 feet observed not far from the outlet, but the majority of the soundings run from 2 to 5 feet; the south-western expansion is the shallowest, with a maximum depth of 3 feet to the west of the central large island (Eilean na Coille), the bottom to the east and south of that island being covered by only 1 foot of water. Over 90 per cent. of the entire lake-floor is covered by less than 10 feet of water, and less than 2 per cent. by over 20 feet of water. The surface temperature in the eastern expansion at 11 a.m on April 21, 1902, was 44°·2, the air-temperature at the time being 49°·5.

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* = Loch of the Macdonald's Field. † = Loch of the Cry (?).

FIG. 11.—LOCHAN SRÒN SMEUR.
(*Photo by H. C. Lamb.*)

3. *Loch Rannoch.**

Loch Rannoch, one of the larger and more important of the lochs in the Tay basin, was the headquarters of the Lake Survey for nearly four months, from March 20 to July 10, 1902, and during that period a great many soundings, as well as observations on the temperature of the water, on the biology, and on the rise and fall of the surface of the loch, were taken, all the members of the staff taking part in the work. The lake trends in an east-and-west direction, and is a lovely sheet of water, the hills on both sides, and the woods clothing its shores in many places, adding beauty to the scene. The famous Black Wood of Rannoch on the south side is of great antiquity. The loch contains many small trout, and is famed for large *Salmo ferox*. It is nearly $9\frac{3}{4}$ miles in length, considerably over a mile in maximum breadth, the mean breadth being about three-quarters of a mile, or about 8 per cent. of the length. Its waters cover an area of over 4700 acres, or nearly $7\frac{1}{2}$ square miles, and it drains directly an area of about 130 square miles, but since it receives the outflow from Loch Ericht, Loch Eigheach, Loch Laidon, Loch Bà, etc., its total drainage area is about $243\frac{1}{2}$ square miles, or 33 times the area of the loch.

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* = Loch of the Ferns.

Over eight hundred soundings were taken in Loch Rannoch, the maximum depth observed being 440 feet, or 20 feet deeper than the maximum depth recorded by Mr. Grant-Wilson during his survey in the year 1888, when he took about 320 soundings. The volume of water contained in the loch is estimated at about 34,387,131,000 cubic feet, or less than a quarter of a cubic mile, and the mean depth at $167\frac{1}{2}$ feet, or 38 per cent. of the maximum depth. The length of the loch is 116 times the maximum depth, and 306 times the mean depth. The loch is widest and deepest in the eastern half, narrowing and shallowing towards the west on approaching the island Eilean nam Faoileag, then deepening again to the west of that island. It consists of one large main basin, with two subsidiary small basins over 50 feet in depth towards the west end, separated from the main basin by the shallow water in the neighbourhood of Eilean nam Faoileag. The larger of the two subsidiary basins is about three-quarters of a mile in length, stretching from south of the island An t-Eilean Fearna, at the entrance of the river Ericht, towards the west end of the loch, and the maximum depth recorded in it was 84 feet; the smaller basin lies between the two islands mentioned and towards the northern shore, soundings of 52 and 54 feet having been obtained therein. The main 50-feet basin is about $7\frac{3}{4}$ miles in length, occupying the great body of the loch east of Eilean nam Faoileag, and covering an area exceeding 5 square miles. The 100-feet basin is nearly 7 miles in length, extending from between the mouths of the Killichonan Burn and the Allt Camghouran towards the east end of the loch. The 200-feet basin is 6 miles in length, stretching from within a quarter of a mile from the east end to opposite the house Talla Bheith on the northern shore. The main 300-feet basin is nearly 4 miles in length, stretching from less than half a mile from the east end to opposite Dall on the southern shore, and separated from it by an interval of a quarter of a mile is an isolated sounding of 304 feet. Within the 300-feet basin the bottom sinks in three places along the central axis of the loch below the 400-feet line. The easternmost of these three 400-feet basins is the largest and deepest, situated about $1\frac{1}{4}$ miles from the east end, about two-thirds of a mile in length, and enclosing the maximum depth of the loch (440 feet); a short distance to the west (opposite Craiganour) is a second small basin based upon a sounding of 404 feet; and three-quarters of a mile farther west is the third basin, with a maximum depth of 421 feet. The area of the lake-floor covered by less than 50 feet of water is about 1200 acres (nearly 2 square miles), or 25 per cent. of the total area, while the area between the 50-feet and 100-feet lines is about 750 acres, or 16 per cent., showing a relatively rapid descent beyond the 50-feet line. The area between the 100- and 200-feet lines is about 877 acres, or nearly 19 per cent. of the entire area. The area between the 200- and 300-feet lines is about 950 acres, or over 20 per cent. The area between the 300- and 400-feet lines is about 875 acres, or 18½ per cent., and that over 400 feet about 65 acres, or nearly 1½ per cent. of the total area of the loch.

FIG. 12.—LOCH RANNOCH.

(Photo by Miss McPherson.)

On commencing the survey of Loch Rannoch, the height of the surface above sea-level was determined from Ordnance Survey bench-marks as 668 feet; the level of the loch fluctuated during the progress of the survey, but the soundings have all been reduced to this datum. The officers of the Ordnance Survey on July 19, 1860, found the level of the loch to be 667·5 feet above the sea.

Very many temperature observations were taken between March 20 and July 10, 1902. The surface temperatures need not be discussed in detail; the lowest reading recorded was 37°·9 on March 28, and the highest 59°·8 on June 23, showing a range of 22° in the temperature of the surface water during the period of three months. An interesting series of hourly observations on the temperature of the air and of the surface water at the pier at Rannoch Lodge was taken on June 9. One thermometer was immersed in 3 feet of water outside the pier, and another in 1 foot of water inside the pier, and they were read simultaneously with an air-thermometer at intervals of one hour from 9 a.m. to 10 p.m. The temperature of the air rose gradually, though irregularly, from 48° at 11 a.m. to a maximum of 53° at 4 p.m., falling gradually again to 44°·5 at 9 p.m., and 45° at 10 p.m. The thermometer in 3 feet of water showed a gradual rise in the temperature from 51°·9 at 9 a.m. to 53° at 11 a.m., then a slight fall at noon (52°·7) and at 1 p.m. (52°·5), the maximum (53°·6) being recorded at 2 p.m., falling to 52°·9 at 4 p.m., rising to 53°·3 at 5 p.m., falling gradually to 52°·1 at 8 p.m., then rising to 52°·8 at 9 p.m., and 53° at 10 p.m. The thermometer in 1 foot of water showed a gradual rise in the temperature from 51°·4 at 9 a.m. to the maximum of 53°·6 at 2 p.m., whence it fell gradually to 51°·5 at 9 p.m., the reading at 10 p.m. being 52°. The maximum temperature of the water was recorded in each case at 2 p.m., while the maximum temperature of the air was recorded at 4 p.m., and the temperature of the air was always lower than that of the water, except when the air was at its maximum (53° at 4 p.m.), the thermometer in 3 feet of water then reading 52°·9, while that in 1 foot of water read 53°·3. The temperature recorded in 1 foot of water was lower than that recorded in 3 feet of water in the forenoon and late evening, but at noon and 1 p.m. it was higher, at 2 p.m. and 3 p.m. it was identical, and from 4 p.m. till 8 p.m. it was higher, the greatest difference recorded being 1°·3 at 9 p.m. (52°·8 at 3 feet, and 51°·5 at 1 foot).

The temperatures taken beneath the surface have been collected together and arranged chronologically in the opposite table, which may be useful for future reference and comparison. The great majority of them were taken in the small 80-feet basin towards the west end of the loch, while one series was taken near the east end on April 3, and three series were taken towards the middle of the loch, opposite Craiganour, on May 1, 2, and 23. The table shows well the heating up of the water with the advance of summer. The readings taken near the west end in March are all below 39° Fahr.—that is, below the maximum density point, though surface temperatures exceeding 39°, and in one or two cases exceeding 40°, were recorded

SERIAL TEMPERATURES TAKEN IN LOCH RANNOCH.

Depth. Feet.	22/3/02. West end.	26/3/02. 2.30 p.m. West end.	26/3/02. 3.30 p.m. West end.	28/3/02. 4 p.m. Five miles from West end.	2/4/02. 3.30 p.m. West end.	3/4/02. 4.15 p.m. Three-quarters mile from Kinloch Rannoch.	8/4/02. 4.15 p.m. West end.	9/4/02. 11.35 a.m. West end.	9/4/02. 5 p.m. West end.	10/4/02. 7 a.m. West end.	21/4/02. 3.30 p.m. West end.	1/5/02. Afternoon. Opposite Craiganour.	2/5/02. Craiganour.	3/5/02. 6 p.m. West end.	23/5/02. 11 a.m. West end.	23/5/02. 4 p.m. Opposite Craiganour.	28/5/02. 7.15 p.m. West end.	6/6/02. West end.	7/6/02. 10 a.m. West end.	7/6/02. 8 p.m. West end.	21/6/02. 6.30 p.m. West end.
	° F.	° F.	° F.	° F.	° F.	° F.	° F.	° F.	° F.	° F.	° F.	° F.	° F.	° F.	° F.	° F.	° F.	° F.	° F.	° F.	° F.
Surface	38·4	38·8	38·0	38·9	39·4	38·9	42·3	39·9	39·7	39·3	45·8	41·4	41·2	45·3	47·8	42·0	48·3	50·0	48·8	49·8	52·0
3	—	—	—	—	—	—	—	—	—	39·8	—	—	—	—	—	—	—	—	—	—	—
5	—	—	38·0	—	—	—	—	—	39·6	39·5	45·8	41·8	—	45·2	—	—	—	50·0	48·8	—	52·0
10	—	38·3	38·0	—	39·4	39·0	—	39·8	—	39·5	45·0	41·7	41·2	—	—	42·0	48·0	49·5	48·9	50·0	52·0
15	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	48·8	—	49·0	—
20	—	38·3	—	—	39·4	38·9	—	39·7	—	39·5	43·2	41·6	41·2	—	47·3	42·1	48·0	—	48·8	—	51·3
23	—	—	—	38·3	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
25	—	—	—	—	—	—	—	—	—	—	—	41·3	—	45·0	—	—	—	48·4	—	47·6	—
30	38·6	38·3	—	—	—	—	39·9	39·8	—	—	—	41·3	—	—	—	—	—	—	48·5	—	51·0
32	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	48·2	—	—
35	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	48·9	47·2	—	—
40	—	38·3	37·9	—	39·4	38·9	—	39·8	39·6	39·6	—	—	—	—	47·2	—	48·0	—	47·2	46·9	—
45	—	—	—	—	—	—	—	—	—	—	—	—	—	—	47·2	—	—	—	—	—	—
50	—	38·3	—	—	—	—	39·9	40·0	39·6	39·5	43·0	41·3	—	45·0	47·2	42·1	—	—	46 8	46·4	49·9
60	—	38·3	37·9	—	—	—	—	40·0	—	—	—	—	—	—	46·9	—	—	—	—	—	—
70	38·8	38·3	—	—	—	—	39·8	40·0	—	39·4	43·0	—	—	44·1	46 9	42·2	—	—	—	—	47·0
75	—	—	—	—	39·3	—	—	—	39·3	—	—	—	—	—	—	—	—	—	46·3	46·1	—
80	—	—	—	—	—	—	—	40 0	—	39·3	42·8	—	—	—	—	—	—	—	—	—	—
100	—	—	—	—	—	38·9	—	—	—	—	—	40·3	40·8	—	—	41·9	—	—	—	—	—
200	—	—	—	—	—	38·9	—	—	—	—	—	40·0	40·2	—	—	—	—	—	—	—	—
300	—	—	—	—	—	—	—	—	—	—	—	40·0	—	—	—	—	—	—	—	—	—

shore during the last days of March. On April 2 and y, the temperature was above that of maximum density ; the observations taken near the east end on April 3 showed emperature of the water from surface to bottom was just imum density point. The water in the small western basin mperature under 40° up to April 10, and was practically from top to bottom, but on April 21 and subsequently the re rose, and there was a considerable range between the ure of the upper and lower layers. The water in the main d a temperature of 40° at 200 and 300 feet on May 1; on he temperature was 40°·2 at 200 feet; and on May 23 it was 100 feet. By the beginning of June the water near the surface ained a temperature of 50°, and by June 21 that temperature d down to 50 feet, the upper 10 feet having on that date a ature of 52°.

4. *Loch Lyon.*

ch Lyon lies at a high elevation at the head of Glen Lyon, amid and mountainous scenery, its waters being carried by the river into the river Tay a short distance above the mouth of Loch Tay; ntains both salmon and trout. It trends in a north-east and south- direction, and is extremely simple both in outline and in the con- ation of the bottom. It is of nearly uniform width, except for a of alluvium, brought down by the river, on the south-eastern re. It is about 1¾ miles in length, with a maximum breadth of over uarter of a mile, the mean breadth being over one-fifth of a mile, or per cent. of the length. Its waters cover an area of about 236 acres, or er one-third of a square mile, and it drains an area of over 10½ square iles, an area nearly twenty-nine times greater than that of the loch. ver one hundred soundings were taken in Loch Lyon, the maximum epth observed being 100 feet. The volume of water contained in the och is estimated at about 460,750,000 cubic feet, and the mean depth t 45 feet, or 45 per cent. of the maximum depth. The length of the och is 92 times the maximum depth, and 205 times the mean depth. As stated, the loch forms a simple basin, the bottom sinking gradually n all sides towards the deepest part, which is approximately centrally laced. The deep water, however, approaches much closer to the south- west end than to the north-east end, where the 25-feet line is distant bout a quarter of a mile from the shore, probably through silting up f the lake-floor at that end. The 25-feet basin is nearly 1½ miles n length, the 50-feet basin is about 1⅓ miles in length, and the 75-feet basin is about 1⅙ miles in length. The area of the lake-floor covered by ess than 25 feet of water is about 92 acres, or 39 per cent. of the total rea of the loch; the area between the 25- and 50-feet contour-lines is bout 36 acres, or over 15 per cent.; the area between the 50- and

75-feet contours is about 55 acres, or over 23 per cent.; and the area over 75 feet in depth is about 53 acres, or less than 23 per cent. of the entire area of the loch. The comparatively flat-bottomed character of the deep basin is indicated by the larger proportion of the bottom covered by water between 50 and 75 feet in depth, as compared with the proportion covered by water between 25 and 50 feet, the average slope being thus considerably steeper in depths of 25 to 50 feet than in depths of 50 to 75 feet; and this latter gentler slope is continued into the deeper water over 75 feet in depth, as shown by the nearly equal areas on both sides of the 75-feet line. The large proportion under 25 feet in depth is due to the considerable silted-up area towards the north-east end of the loch, already referred to. Loch Lyon was surveyed by Sir John Murray, Dr. Johnston, and Mr. Parsons on May 10, 1902. No bench-marks were to be seen along the shores, nor on the Ordnance Survey charts, but the height of the surface of the loch was estimated as being about 1050 feet above the sea. Lines of drift were observed 4 feet above the water, which, according to the keeper, was about its

FIG. 13.—LOCH LYON.
(*Photo by Sir John Murray.*)

normal height at the time of the survey; the water rises suddenly and falls as quickly, and might fall perhaps a foot lower than on the date of the survey. Thus a range of about 5 feet in the level of the water is indicated. The temperature of the surface water on May 10, 1902, when commencing the survey, about noon, was 48°·7 at the edge of the bank at the north-east end (the temperature of the air at the time being 46°·4), and readings taken along the shore gave 50°, 51°·8, 52°·5, and 58°. In the afternoon, readings of 47°·9 were taken in shallow water towards the northern shore, 48°·9 near the south-west end, and 46°·4 in the centre of the loch. These observations show a range of 11°·6 in the temperature of the surface water throughout the day, viz. from 46°·4 to 58°.

5. *Lochs Dochart and Iubhair.*

Loch Dochart.—Loch Dochart, situated at the foot of Ben More amid beautiful scenery, is the westernmost of the lochs belonging to the Tay branch of the Tay river-system, being evidently an expansion of the river Fillan, which forms the headwaters of this branch. It receives the drainage from a considerable tract of country, is very shallow, the bottom is very weedy, and there are many reeds, especially at the west end. Loch Dochart is nearly two-thirds of a mile in length, with a maximum breadth of nearly one-sixth of a mile, the mean breadth being over one-tenth of a mile, or 18 per cent. of the length. Its waters cover an area of about 46 acres, or nearly one-fourteenth of a square mile, and it drains an area of nearly 39 square miles, or 555 times the area of the loch. Nearly seventy soundings were taken in Loch Dochart, the maximum depth observed being 11 feet; but this depth is of very limited extent, only two isolated soundings being recorded near the west end of the loch, while by far the greater portion of the bottom is covered by less than 5 feet of water. The volume of water contained in the loch is estimated at 10,032,000 cubic feet, and the mean depth at 5 feet, or 46 per cent. of the maximum depth. The length of the loch is 298 times the maximum depth, and 652 times the mean depth. Loch Dochart was surveyed by Dr. Johnston and Mr. Parsons on April 28, 1902, and the level of the surface of the water was determined from Ordnance Survey bench-mark as being 513 feet above sea-level. The temperature of the surface water at 11.30 a.m. on that date was 50°·1, the temperature of the air at the same time being 49°.

Loch Iubhair.[*]—Loch Iubhair (or Nubhair) receives the outflow from Loch Dochart by a river considerably less than half a mile in length, so that they may almost be regarded as forming one lake. It affords fair trout-fishing, and the scenery round about is very beautiful. Loch Iubhair is about 1⅓ miles in length, with a maximum breadth of about one-third of a mile, the mean breadth being nearly one-sixth of a mile, or 12 per cent. of the length. Its waters cover an area of about 135½ acres, or over one-fifth of a square mile, and it drains directly an area of about 5¾ square miles; but, since it receives the outflow from Loch Dochart, its total drainage area is over 44½ square miles, or 212 times the area of the loch. Over one hundred soundings were taken in Loch Iubhair, and the maximum depth observed was 65 feet. The volume of water contained in the loch is estimated at 147,284,000 cubic feet, and the mean depth at 25 feet, or 38 per cent. of the maximum depth. The length of the loch is 110 times the maximum depth, and 286 times the mean depth. Loch Iubhair trends in a north-east and south-west direction, and is rather peculiar in outline, resembling somewhat the italic letter *f*, constricted in the central portion, where a ridge crosses the loch with a maximum depth of 36 feet on it. The loch widens and deepens on each side of this constriction, the maximum depth of the loch having been found in the north-eastern part, where the loch is widest, the greatest depth observed in the south-western part being 49 feet. The 25-feet basin is a continuous area over a mile in length, approaching close to the northern shore, but distant about a quarter of a mile from the south-west end. The area of the lake-floor covered by less than 25 feet of water is about 72 acres, or 53 per cent. of the total area of the loch; the area between the 25- and 50-feet contours is about 59 acres, or 44 per cent., while the area covered by over 50 feet of water

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[*] = Loch of the Yew-trees.

FIG. 14.—LOCH EARN.

(*Photo by J. Parsons, B.Sc.*)

is about 5 acres, or 3 per cent. of the entire area of the loch. Loch Iubhair was surveyed by Dr. Johnston and Mr. Parsons, at the same time as Loch Dochart, on April 28, 1902, the level of its surface being a foot lower than that of Loch Dochart, viz. 512 feet above the level of the sea.

6. *Loch Earn.**

Loch Earn is situated amid lovely surroundings, the hills on both sides being clothed with rich woods, and splendid mountain scenery bounds the horizon towards the west, while on the south Ben Voirlich towers to a height of 3200 feet. It contains trout and salmon, and also *Salmo ferox*. It has been said that the loch is 100 fathoms (= 600 feet) deep in some places, but this is disproved by the soundings taken by different surveyors. Mr. Grant-Wilson took over 180 soundings in 1888, Sir John Murray and the late Mr. F. P. Pullar took about 150 soundings in 1900, and the Lake Survey took 500 soundings in 1902, but in no case was the depth found to exceed 288 feet. On the accompanying map (Plate VII.) only the Lake Survey soundings are laid down, and the contour-lines drawn in from them.

Loch Earn is 6½ miles in length, and four-fifths of a mile in maximum breadth, the mean breadth being three-fifths of a mile, or 9½ per cent. of the length. The waters of the loch cover an area of over 2400 acres, or nearly 4 square miles, and it drains an area of over 54½ square miles—an area fourteen times greater than the area of the loch. Five hundred soundings were taken in Loch Earn, the maximum depth observed being 287 feet, which agrees very well with the maximum recorded by Mr. Grant-Wilson in 1888, viz. 48 fathoms, or 288 feet. The volume of water contained in the loch is estimated at 14,420,638,000 cubic feet, and the mean depth at 138 feet, or 48 per cent. of the maximum depth. The length of the loch is 118 times the maximum depth, and 245 times the mean depth.

Loch Earn forms a simple basin, the lake-floor sinking gradually on all sides down to the greatest depth, as is well shown by the longitudinal and three cross-sections on the map. The 50-feet contour-line follows approximately the outline of the loch, approaching very close to the west end, where between the mouths of the Ogle and Kendrum burns a sounding of 57 feet was taken about 300 feet from the shore, giving a slope of 1 in 5·3. At the opposite end of the loch the 50-feet contour is met with about one-third of a mile from the bridge across the river at St. Fillans. The 100-feet basin approaches to within less than a quarter of a mile from the west end, and less than half a mile from the east end, and is over 5¾ miles in length; it covers an area of nearly 2⅓ square miles. The 200-feet basin is 4½ miles in length, stretching from three-quarters of a mile from the west end to 1¼ miles from the east end, and covers an area of 1⅛ square miles. The 250-feet basin is nearly 2 miles in length, and a quarter of a mile in maximum width, extending from 1½ miles from the west end to 3 miles from the east end. The maximum depth of 287 feet was observed near the centre of the loch, between the mouths of the Allt Bhacaidh on the north and the Allt Dhùnain on the south, about 2¾ miles from the west end, and 3¾ miles from the east end. The area of the lake-floor covered by less than 100 feet of water is about 926 acres, or 38½ per cent. of the total area of the loch. The area between the 100- and 200-feet contour-lines is about 755 acres, or 31½ per cent., and the area covered by more than 200 feet of water is about 700 acres, or 30 per cent. The flat-bottomed character of the loch is indicated by the last-mentioned percentage, which is nearly equal to the preceding one, though the interval of depth is only 87 feet as compared with the previous interval of 100 feet. The comparatively uniform average slope from the shore down to a depth of 100 feet is shown by the fact that the areas on each side of the 50-feet line are nearly equal, viz. 477 acres (or nearly 20 per cent. of the entire area of the loch) between the shore and the 50-feet contour, and 449 acres (or nearly 19 per cent.) between the 50- and 100-feet contours.

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* Earn = water.

Loch Earn was surveyed by Messrs. James Parsons and James Murray on May 14 to 19, 1902, and the level of the surface of the water was determined by levelling from Ordnance Survey bench-mark as 317·2 feet above sea-level. This is identical with the level determined by the surveyors of the Ordnance Survey on August 25, 1899.

On May 14, at 3.45 p.m., the temperature of the surface water near Lochearnhead was 46°·1 (the air-temperature being 48°); at 6 p.m. the surface temperature was 44°, and at 7 p.m. near shore 47°·2. On May 15, at 11.30 a.m., the surface temperature near shore, about a mile east of Lochearnhead, was 44° (the air-temperature being 40°·5). On May 16, at 10.30 a.m., the surface temperature at the St. Fillans end of the loch was 44°·1 (the temperature of the air at the time being 45°), and at 1.30 p.m. it was 44°. On May 17, at 5 p.m., the surface temperature off Dalkenneth over the deepest part of the loch was 43°·8 (the air-temperature at the time being 47°·7). The range observed in the temperature of the surface water during those four days was thus 3°·4, from 43°·8 to 47°·2, the range in the air-temperature during the same period being 7°·5, from 40°·5 to 48°.

A series of temperatures beneath the surface was taken in the deepest part of the loch on May 17, at 5 p.m., with the following results:—

Surface	43°·8	Fahr.
5 feet	43°·5	„
10 „	43°·4	„
20 „	43°·3	„
30 „	43°·2	„
50 „	43° 2	„
100 „	43°·1	„
125 „	42°·3	„
150 „	42°·1	„
200 „	42°·0	„
250 „	41°·5	„

SUMMARY TABLE.

Giving details concerning the Lochs described in this Paper.

Loch.	Height above sea. Feet.	Number of soundings.	Length in miles.	Breadth in miles.		Mean breadth per cent. of length.	Depth.			Ratio of depth to length.		Volume in million cubic feet.	Area in square miles.	Drainage area.	
				Max.	Mean.		Max. feet.	Mean feet.	Mean per cent. of max.	Max.	Mean.			Total in square miles.	Ratio to area of loch.
Buidhe	981·0	39	0·32	0·24	0·16	50·0	3	1·500	50·0	563	1126	2	0·05	11·12	222·40
na Stainge	966·5	55	0·54	0·40	0·15	27·8	14	5·097	36·4	204	559	11	0·08	11·79	147·37
na h-Achlaise	962·0	112	0·82	0·76	0·35	42·7	28	9·580	34·2	155	452	76	0·29	1·08	3·72
Bà	957·0	315	2·15	1·02	0·43	20·0	30	8·098	27·0	378	1402	206	0·92	17·41	18·92
Laidon and Dubh Lochan	923·9	486	5·30	0·70	0·34	6·4	128	35·194	27·5	219	795	1,762	1·80	47·66	26·43
Sròn Smeur	—	68	0·56	0·22	0·14	25·0	33	10·310	31·2	90	287	23	0·08	1·89	23·62
Eigheach	818·2	78	0·88	0·21	0·10	11·4	28	6·088	21·7	166	763	16	0·09	63·42	704·66
Rannoch	668·0	808	9·70	1·12	0·76	7·8	440	167·460	38·1	116	306	34,387	7·37	243·57	33·05
Dochart	513·0	67	0·62	0·16	0·11	17·7	11	5·021	45·6	298	652	10	0·07	38·85	555·00
Iubhair	512·0	107	1·35	0·32	0·16	11·9	65	24·960	38·4	110	286	147	0·21	44·61	212·43
Lyon	1050·0	109	1·74	0·26	0·21	12·1	100	44·870	44·9	92	205	461	0·37	10·56	28·54
Earn	317·2	499	6·46	0·80	0·61	9·5	287	137·830	48·0	118	245	14,421	3·91	54·68	13·98
		2743										51,522	15·24	358·42*	23·19

* It must be remembered that the drainage area of Loch Rannoch includes the areas draining into the other lochs given at the head of the table, and that the Loch Iubhair drainage area includes that of Loch Dochart.

Romans was the same in all these harbours, and is very different in principle to that employed nowadays. The modern engineer constructs his breakwater of solid continuous masonry so as to completely stop the waves. The old Roman breakwaters were composed of separate piers of masonry or concrete, which rose from firm foundations on the sea-bottom to a few feet above the surface. The piers were strong and broad, and were close enough together to break the main force of the waves, although some wash entered through the narrow spaces. Consequently, in the Roman harbour there could never have been that absolute tranquillity in storm which is the ideal of the modern harbour-designer.

On the other hand, these very openings were of considerable advantage on a coast along which there is a large and unceasing drift of sand, the effect of the prevalent currents and winds. A marine *cul de sac* unswept by currents soon becomes silted up with mud and sand. The Roman had not the modern resources for dredging at his command, and so it was necessary that his harbours should be constructed in such a manner as not to need them. The success of the Roman plan may be estimated by the fact that harbours which have been in use for nearly two thousand years have only lately been found to need modification.

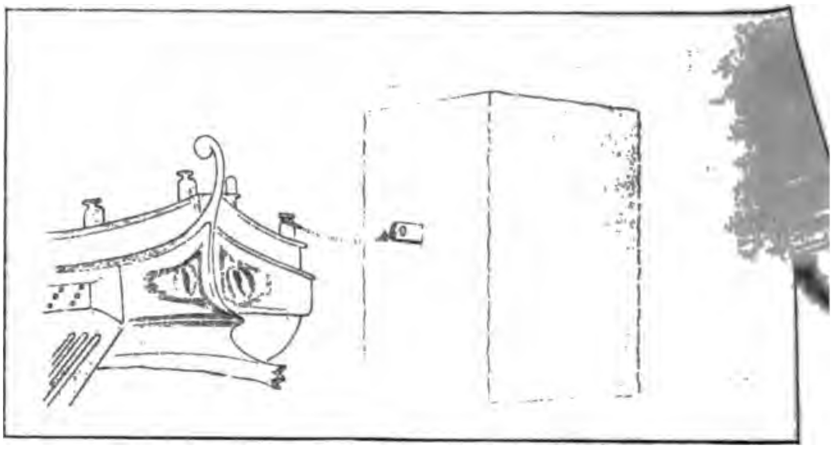

FIG. 12.—ROMAN GALLEY MOORED TO A PILA.
Conjectural reconstruction of pier showing original height of mooring ring.

Harbour of Puteoli.—The largest and best-known Roman breakwater is that at Puteoli, commonly called the Bridge of Caligula. This great work consisted of fifteen tall piers of concrete, some of 52 feet square, others smaller, rising from 49 feet of water to some 16 feet above the surface. The tops of the piers were connected by arches, and the whole work was often referred to as the "opus pilarum," or "moles puteolanæ." Unfortunately, but little of the old work is now to be seen, for the for most of them were provided with projecting stones perforated for making fast the hawsers. Owing to the general subsidence of the land, these mooring-rings, which must originally have been at a convenient height above the surface of the water, are now from 4 to 6 feet below it. Twelve of these rings have been noted by Fazio. The pier furthest from the shore shows *Lithodomus* borings and the calcareous tubes of *Serpulæ*, to a height of 12 feet above the present level of the sea.

Drawings made of the ruined bridge before it was concealed from view,* show that the springing of the arches was under water (Fig. 13). The Abbé Breislak has pointed out that the piers, when built, must have reached the surface before the springing, and we may therefore argue that they must be at a lower level than formerly. A very satisfactory confirmation of this view is to be obtained from those ancient drawings, which represent the *opus pilarum* in Roman times (Fig. 14). The springing is shown as far from the water as the arch is wide. If we take 35 feet as the average width of an arch, we cannot, after making due allowance for artistic exaggeration, regard 17 feet as an excessive measure of the subsidence which has occurred since the Roman period.

Pausanias' Island.—Within the harbour is depicted a little island covered with buildings (Fig. 14). This island does not exist nowadays, but it is probably that mentioned by Pausanias. "Off Dicæarchia, which belongs to the Etruscans, there is boiling water in the sea, and an island has been constructed artificially, that the water may be utilized for warm baths."† There is a shoal, 13 feet below water, inside the fourth to the eighth piers of the bridge, and the island is represented as lying off the last pier, but only eight piers of the bridge are drawn. Were the other seven of later construction?

The Second Harbour of Puteoli.—There is believed to have been a second or subsidiary harbour at Puteoli, beneath the acropolis. Strabo distinctly refers to the existence of more than one in his time. "This city," he writes,‡ "has become a place of extensive commerce, having artificially constructed harbours, which were much facilitated by the facile nature of the sand, which contains much gypsum, and will cement and consolidate thoroughly. For, mixing the sand with chalk-stones, they construct moles in the sea, thus forming bays along the open coast, in which the largest transport ships may safely ride." And Fazio has described many submerged fragments of building as parts of the harbour defences.

At a distance of 85 to 115 yards from the shore are many piers arranged in two rows parallel to one another and to the shore. A third row of rectangular piers starts at right angles from the shore as if to meet the western extremity of the doubled rows. The piers are all 4 to 7 feet below the surface.

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* J. D. Harding's beautiful water-colour of Pozzuoli and of the shore-end of the "Bridge" has been reproduced by the editor of *English Water-Colour* in the Studio Library, under the erroneous title of "An Italian Lake Scene."

† Pausanias, viii. 7, 3. Frazer's translation. ‡ 'Geogr.,' 245.

Going eastward, we meet with an accumulation of submerged ruins which are not easy to make out, but then follows another basin which is bounded by the shore on the north, the ruins on the west, a single row of piers on the south. The openings between the piers are about 9 feet wide, and there seems to have been a channel for ships between the eastern end of the row of piers and a kind of quay on the east, which is said to be perforated with openings, 4 to 5 feet in width.

Harbour of Nisida.—On the north side of the little island of Nisida, the safety of the anchorage was secured by the construction of two series of piers. The western series consisted of eight and the eastern of seven piers. They have almost all fallen or have become concealed by the modern breakwaters which have been heaped around and over them, but one or two may still be made out. It is fortunate that careful drawings were made when the first modern improvements were being projected in 1814. It was then recorded that not only were some of the piers provided with stone rings for mooring vessels like those upon the Bridge of Caligula, but that even bollard heads were still *in situ* upon them, submerged beneath some 6 to 7 feet of water. Two of the piers of the western series bear two fastenings for ropes, each at the same level. One is a hole cut in a projecting horizontal stone; the other is a bollard head standing in a semicircular niche in the pier (Fig. 15). The upper part of the stone is 11 feet below low-water mark, whereas originally it was probably quite 4 feet above.* So, if we add together 11 + 4 + 2 (the thickness of the stone), we shall get 17 feet as the total amount the land is below the Roman level here.

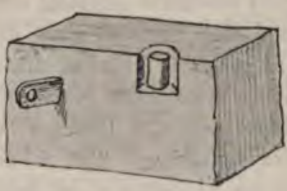

FIG. 15.—MOORING RING AND BOLLARD DISCOVERED 11 FEET UNDER WATER BY FAZIO, IN NISIDA HARBOUR.

Between Nisida and the sandy beach of Bagnoli, the conditions are nearly adapted for the formation of a sand-isthmus, with the result that the island would become a peninsula, like our Isle of Portland. The deposition of sand, however, is prevented by the prevalent westerly current which sweeps through the channel. The tendency is demonstrated both by the silting up of the harbour since the completion of the new continuous moles, and by the sand-shoal in the middle, which may have been a sand-dune connected with the mainland in Roman times.

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* Orosius states that the ships of Antony's fleet at Actium (31 B.C.) were 10 feet in height above the water-line. Bollard-heads are shown upon the bows of the ships in a Pompeian fresco (No. 8604, Naples Museum) (cf. Fig. 12), and so 4 feet is not an excessive estimate for the height above water of a bollard or mooring-ring on shore. Such bollards, which were probably known as *tonsillæ*, have escaped the notice of most writers on ancient ships.

Harbour of Misenum.—The harbour of Misenum was provided with two series of piers, designed by the engineers of Agrippa to protect the anchorage from the *scirocco levante.* The piers were disposed alternately, so that waves passing between two piers of the outer series must break against piers of the inner series. There were eight piers in each row, with 3 to 3¼ fathoms of water between them. The tops of all these piers are now under water, three coming within 1½, ¼, and ¾ fathoms from the surface respectively, but the indefatigable Fazio discovered a horizontal mooring stone fixed in one of the two piers furthest from the shore. The top of this stone was 3 feet below the surface, and therefore has been taken to indicate a subsidence of land-level of 9 feet at least. There are 4 fathoms just off the end pier. Our further investigations were abruptly terminated by a coastguard officer, whose warning was a reminder that Misenum has once more, after a lapse of nearly two thousand years, become a military harbour.

Two Roman tunnels pierce the Pta. di Pennata, and doubtless gave access to an ancient foreshore inside the promontory. Their floors, which we believe to have once been dry, are now 2½ fathoms under water, like the floor of the passage through the Capo Miseno, and the floor of the Greek cave.

The Julian Harbour.—The alterations in the level of the land and the eruption of the Monte Nuovo have so changed the distribution of land and water in the vicinity, that it is by no means easy to reconstruct the exact physical conditions as they existed before the works of the Julian harbour were executed. We imagine Avernus a deep lake as at present, for even allowing the land to be 20 feet lower than in Roman times, the lake would still have been 80 feet deep. On the other hand, the Lucrine lake, although much larger, was probably always shallow. The raised shingle beach separating the waters from the sea probably stood further out, and while maintaining its present height above the water, must have been at a lower level relatively to the land.

The problems which faced the engineers of Agrippa were, firstly, to dig a ship canal from the sea to the safe and deep anchorage in Avernus; and, secondly, to ensure that the entrance to the channel should be practicable in all weathers, and should not be liable to become silted up.

Of their work not many traces are visible, partly because, having been carried down with the land in sinking, it has become submerged in water or sand, partly because it was destroyed or buried by the eruption of the Monte Nuovo, when the greater part of the Lucrine became filled up. So far as can be made out, the actual entrance to the ship canal in the beach of the Lucrine lake was narrow, and difficult of access in rough weather. It was therefore protected by a breakwater of eight piers arranged along a line parallel to the shore, so as to leave a navigable channel which ships might enter from either end.[*] The western entrance was still further protected by a row of piers stretching out from the shore at right angles, and ending in a very large and strong pier, the "Lanterna del porto Giulio." Agrippa probably also raised and strengthened the bank between the Lucrine and the sea. The remains of the outer row of piers form the Fumose Reef.[†] They are arranged in a line south-west to north-east, so that the spaces between the piers are oblique to the southerly winds which blow home here. The harbour therefore consisted of three basins—Avernus, Lucrine, and the outer basin within the eight piers. The work is believed to have been done in 37 B.C.,[‡] and it naturally received the highest praise from the court poets.[§]

However, a few years afterwards the canal seems to have silted up; only vessels of shallow draught could enter, and it became unfit for an anchorage.[‖] And so Avernus, like Brundusium, had to be abandoned by Augustus as a station for the Roman fleet. Misenum was substituted for Avernus, and Ravenna for Brundusium.[¶]

The Harbour of Cumæ.—It is difficult to make out any traces of a harbour, but it is possible that ancient works may lie buried beneath the sands. To judge, however, from the description of Cumæ by Dionysius,[**] it would appear that the ancient harbour was on the other side of the promontory, and that the ships which took part in the naval battle with the Syracusans had their moorings in the harbour of Misenum.

Lazzaretto di Nisida.—The Bourbon Lazzaretto di Nisida stands on a Roman site of a remarkable nature. The little islet rock (I. di Chioppino, Pioppino, or il Purgatoro), which now forms a strong and natural termination to the eastern mole of the harbour, is traversed from end to end by a slightly curved passage of Roman workmanship, which was lit by apertures in the rock, but these are now submerged. Eight of these windows pierce the eastern and one the western side. In the passage the water is 11 feet deep, although, owing to the accumulation of *débris* near the ends, the floor may be even deeper. At each end is an opening covered by an arch under which the sea ebbs and flows, and which can be entered by boat. The arch over the north end of the passage is rounded, 5 metres wide, and constructed of flat tiles. The south arch is pointed and is constructed of alternating layers of tiles and tufa, the rock above being faced with

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[*] "Mare Tyrrhenum a Lucrino molibus seclusum" (Pliny, 'Nat. Hist.,' xxxvi. 125, edit. Mayhoff).

[†] Perhaps derived from *saxa famosa* or *famosi*. [‡] Cassiodorus, 'Cron.,' ii.

[§] "Or shall I tell of her harbours, of the barriers set upon the Lucrine, and the thunder of the indignant sea where the Julian wave echoes afar in the tideway, and the Tyrrhene surge pours into the channels of Avernus?" Virgil, Georg., II. v. 161–164; also cf. Horace, 'Art. Poet,' 69; D. Cassius, xlviii. 49.

[‖] "Εἴσπλουν δέχει πλοίοις ἐλαφροῖς ἐνορμίσασθαι μὲν ἄχρηστος." Strabo, 'Geogr.,' 245.

[¶] Brindisi harbour was not rendered serviceable again until dredged by Pigonati in 1776–1778. [**] 'Olympiad.,' lxiv.

opus lateritium. We have no means of knowing the purpose of this gallery in the rock, or the manner of fabric of which it once formed a part, but it is evidence that the building stood at least 11 feet higher out of the water than it does at present, and as the sea between this and the mainland is only 10 feet deep, there was in all probability a way across in Roman times. There is also evidence that the tunnel at a subsequent period has been completely submerged, because barnacle-shells have been found adherent to the stones on the roof. This submergence was no doubt coeval with that which resulted in the formation of the groove of erosion on the cliffs at Trentaremi, and at the eastern end of the island of Nisida itself. The same low land-mark has been noted by Babbage on a cliff by the side of the road from Naples to Pozzuoli, where, from perforations in the rock, he extracted fragments of the shells of Lithophagus, Serpula, Arca, and Balanus.

Submerged Ruins near Pozzuoli.—The ancient harbour works have already been described. To the west the shore was lined for a considerable distance by an almost uninterrupted succession of public buildings, and a most convincing demonstration of the rise and fall of land is afforded by some of the ruins. The well-known "Temple of Serapis" or Macellum is described in every geological text-book, and therefore needs no further notice here than the oft-repeated statement that its lowest floor is now 5 feet below the surface of the sea, whereas its three columns "sono un tesoro in geologia, son medaglie coniate dalla natura, le quali non possono essere falsificate" (Pilla). They prove a submergence of about 19 feet below the present sea-level.

Beyond the old Macellum lay the Ripa, a quay with colonnades along which the Puteolans delighted to promenade; and further still, below the Starza, was a Porticus or colonnade, of which there has lasted a long row of columns standing in the sea, which is generally shown as the "Tempio delle Ninfe," and which may have detained "C. Avianium, fortasse in porticu Neptuni ambulantem,"* when he was expected at the villa of Q. Hortensius at Bauli. The ruins may be considered to indicate the ancient shore-line.

It is a matter of interest that certain repairs to the Ripa had to be undertaken in Roman times, perhaps on account of subsidence of the land. The manner of the restoration is recorded in two inscriptions in the Naples Museum.†

Ruins of Bauli.—The beaches of the Lucrine lake and of Baia are separated by a headland, the Pta. dell' Epitaffio, which, jutting out into the sea, forms the northern limit of the Bay of Baia. The modern road from Pozzuoli to Baia rises some yards from the sea to pass through a cutting near the extremity of this headland, and many ruins may be seen on the hillsides. Scotti and Mortorelli support their contention that the ancient Bauli is to be identified with this site rather than with Bacoli on the other side of Baia by much interesting and convincing erudition, and we are fully in agreement with their view that Bauli must have been here near the Via Herculanea, and between the "portus Baiarum" and "Lacus Lucrinus."*

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* Cic., 'Acad.', ii. 25. 80.

† Inscr. Neap. 2510 and 2500.

The shore is lined with the ruins of ancient houses, of which the greater part have been washed away.

The most imposing house of all is a three-storey building of which the lower storey is submerged. The scale of the building may be judged by the fact that the chambers are 3½ yards across, and that the vaulting of the ground-floor rooms is 6 feet above the water-level, the floor being about 5 feet below. At the water-level is a course of red tiles perforated with round holes. It is interesting to note that the walls have been eroded at the springing of the arches of the upper storey. We have, therefore, further confirmatory evidence of the greatest submergence having occurred since Roman times, and the well-preserved walls below the erosion-line show that the earth-movements must have been relatively rapid.

In the face of the cliff above the beach may be seen many chambers of another building, of which the front wall has been demolished by the waves.

Were the land-level of the site of Bauli to be raised, the beaches on either side would extend further along under the cliffs, and all the buildings on the shore would be provided with an easy means of access. So it is not at all improbable that in early times the road from Baiæ to Puteoli may have passed round the Pta. dell' Epitaffio, and then along the Via Herculanea close to the edge of the water. And by this highway the first seaside houses at Bauli may have sprung up.

Stagnum Baiarum.—The identification of the Stagnum Baiarum has always been a difficulty with archæologists, and it has generally been considered synonymous with the Lucrine lake. The pool of Baiæ is described in the life of Alexander Severus as if it were a lagoon which was not at first in communication with the sea, but was opened to it, and it is the "STAGNV" depicted upon the Borgiano and Piombino glass vases. "In matrem Mammæam unice pius, . . . ita ut faceret in Baiano palatium cum stagno, quod Mammææ nomine hodieque censetur. Fecit et alia in Baiano, opera magnifica in honorem affinium suorum, et stagna stupenda admisso mari." †

In the Bay of Baia we have a curve in the coast suitable for beach formation, but the water deepens rather more rapidly than off the Lucrine or Fusaro shore; were it shallower, we might expect to find it crossed by a sand-bar thrown up by the sea. If, in accordance with our theory, we imagine the land to be raised 16 feet, the sea would retreat from the Bay of Baia, leaving behind an isolated pool of water, 1 to 2 yards deep, a lagoon like the Lucrine lake or the Mare Morto, separated from the sea by a sandbank (Map, p. 236, and Fig. 16).

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* 'Nat. Hist.,' edit. Janus, iii. 61.

† Lampridius, 'Vit. Alex. Severi,' 26.

The proximity of a low foreshore and of such a pool of stagnant water might have contributed to the notorious unhealthiness of Baiæ in certain seasons,[*] and we believe that we have here discovered the true site of the "stagnum Baiarum."[†]

Nero's great ship canal would, if completed, have passed through it, and upon the shoals outside we should expect to find the foundations of some of the buildings in the sea of ancient Baiæ.

The Submerged Street between Baia and Misenum.—Some of the maps (Bulifon's map, 1696) of this part of the coast drawn before the beginning of the nineteenth century indicate a street which stretched across the sea-bottom in a southerly direction from Baia towards Bacoli, and which may have been the Via Miseni by the side of which Agrippina was interred.[‡]

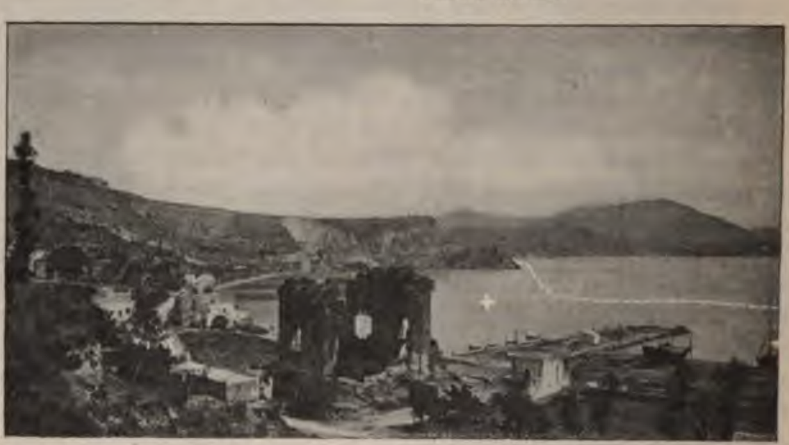

FIG. 16.—BAY OF BAIA.

The dotted line represents the ancient coast-line; the cross marks the site of the Stagnum Baiarum.

The remains of this street are by no means as numerous or as close together as they appear to have been when these maps were prepared. In the little bay between the Pta. di Cannito and the northern rim of the Bacoli crater the red-brick walls of a house rise from water about 5 feet deep. The bottom is sandy. To the south of this are other walls, and more may be seen under the cliff side of the Cento

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[*] 'Gratulor Baiis nostris, si quidem, ut scribis, salubres repente factæ sunt.' Cicero to Dolabella, fam. ix. 12. 1. Written 45 B.C.

[†] Not the lacus Baianus, which was probably the Lucrine. Tacitus. Ann. xvi. 4.

[‡] Tacitus, Ann. xiv. 9.

Camerelle headland, where there is an ancient structure 5 feet high standing in 8 to 10 feet of water.

Lago Fusaro or Lacus Acherusia.—The western shore of the Phlegræan Fields is chiefly characterized by its shallow lagoons. Between the promontories of Cape Misenum and the Monte di Procida is the Mare Morto, divided from the sea by the Miniscola beach; the Lago Fusaro fills the bay in the hills between Monte di Procida and the hill of Cumæ; north of Cumæ is the Lago di Licola, and still further north is the Lago di Patria. All these lakes are separated from the sea by sandy beaches of relatively narrow width, and their waters stand, in consequence, at sea-level. Any alteration, therefore, in land-level would be followed immediately by an alteration in the level of the water in these lagoons, and a rise of the land of but a few feet would have the effect of drying up the greater portion of them. On the other hand, it must also be borne in mind that subsidence of land tends to cause beaches to be moved further inland by the waves, whereas a rise in land-level would tend to preserve beaches from further alteration by wave-action.

The waters of the Lake of Fusaro communicate with those of the sea by a canal which enters a Roman tunnel * under the tufa hill of Torre Gaveta. The tunnel is 196 yards long, 14 to 18 feet wide, and of the same height as the Posilipo tunnel. The depth of water in it is about 4 feet, and a masonry lining of *opus reticulatum* and *lateritium* covered the interior. This tunnel is commonly believed to have been made for the purpose of an emissary to the lake; indeed, Fazio has argued from it that the sea-level in Roman times must have been the same as at present.

On the hill above the tunnel are the ruins of the villa of Servilius Vatia,† and in the sea below are many submerged ruins, the most important of which are described by Niccolini as the Bagno dell' Arco, a chamber hollowed out of a detached rock, with five niches on either side; an ancient cistern; a "bath" with three large niches, also cut in the rock; and a flight of steps. A re-examination of this site has convinced us that here too there is evidence of considerable subsidence. In fact, we believe that the niches and floors of the so-called "baths" were originally above water, and that two of the rock-hewn cavities were the caves which Seneca considered worthy of mention.

The floor of the tunnel through the rock must also have been dry, and therefore it appears that the hill was pierced to permit of access from the land to the buildings which stood clustered at the foot of the hill on the sea. If there had been need of any artificial communication between the Acherusian lake and the sea, it is more likely to have

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* Sometimes called a cave of Cerberus.

† There is no other site which answers so well to Seneca's description: "Speluncæ sunt duæ magni operis, cuivis laxo atrio pares, manu factæ, quarum altera solem non recipit, altera usque in occidentem tenet." Seneca, Epist. lv.

Unfortunately, the evidence that is forthcoming to aid us in elucidating the two latter points, the period and the duration of these changes, is not very exact; but what there is of it has been summed up by Prof. Suess.

There is an undercliff near Pozzuoli, called "La Starza," which was under water from the thirteenth to the beginning of the sixteenth century; this is now high and dry. The date of the rising is supplied by documentary evidence, for Ferdinand the Catholic in 1503 made a gift to the University of Pozzuoli of land "where the sea was drying up." It follows that the land must have begun to rise at an earlier date. In 1538—that is, thirty-five years after—occurred the "horrible and astonishing eruption" of Monte Nuovo, and a great piece of the sea-bottom is stated to have been left dry. According to Prof. Suess,* it was at this time that the rise of the Temple of Serapis, and therefore of the land around the New Mountain, took place; that is, that there was a rise of some 18 to 19 feet in a few hours. While fully allowing a small local rise of land of a seismic nature during the eruption, the evidence does not justify us in assuming the great cataclysm the acceptance of Prof. Suess' theory involves. We have shown that the facts point to the movement of the Temple of Serapis having been accompanied by the movement of Posilipo, of the Sorrentine peninsula, of Capri, and of Gaeta, and therefore probably of a far larger area than the Bay of Naples. And with documentary evidence to the contrary, it is surely not right to assume that so large a portion of the Earth's surface should have suddenly become possessed of sufficient mobility to have sprung up 18 feet in a few hours. And, even had the area been more limited, and restricted to the Bay of Naples, it is still unlikely that a movement so sudden would have remained unchronicled in the time of the gifted viceroy Pietro di Toledo, all the more that he was just then engaged in the erection of a new lighthouse upon a mole in the port of Naples.

That earth-movements of almost seismic rapidity have often occurred is certain; for instance, on December 8, 1861, Palmieri recorded an oscillatory movement of the shore accompanying an eruption of Vesuvius. Rocks covered with seaweed and shells were raised 1·12 metre above the sea-level at Torre del Greco, and during the next three months sank 0·241 metre. But this movement was very local, being almost entirely restricted to the base of the mountain.

It appears, then, that the last great upheaval of the Italian coast, whatever the cause, was on too vast a scale to have occurred during the short-lived convulsion of Monte Nuovo. We believe that the land had been rising steadily, though the movement was unfelt, during the half-century preceding the formation of Monte Nuovo; that this earth-movement was attended by conditions favourable to the production of volcanic phenomena; that an eruption and a sudden local rise took place towards the termination of the whole movement;—in fact, that the eruption of Monte Nuovo was but an insignificant episode of only local importance in the closing scene of a particular phase of an oscillation of the Italian coast.

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* 'Antlitz der Erde,' vol. ii. p. 490.

Subsidence of Land in Recent Time.—As evidence for the nature of the land-movements which have been taking place in the most recent times, we have the general belief among boatmen and fishermen that the land is lower than it used to be in their fathers' day. We have heard it stated that it was possible to walk dryshod along the Posilipo shore from the Villa Grotta Marina to Palazzo Donn'Anna in 1820; now it is impossible. Colonel Macintosh has made a similar observation with regard to the Pozzuoli shore. He was informed that in 1847 monks inhabited the Ospizio dei Capuccini during the warmer months of the year, in spite of the fact that the water stood so high as frequently to enter the lower storey of the building, covering the floor. The refectory, kitchens, etc., had therefore to be entirely abandoned, and the monks resided altogether in the upper storey, and had done so for some time. The side of the convent next the sea (under water in 1847) had been a vineyard, and an old monk (about sixty) stated that he had for many years eaten grapes grown on a spot which he pointed out, and which Macintosh saw covered with about 3 feet of water, and traversed by boats. Vestiges of the walls of the vineyard were to be seen standing in the water.

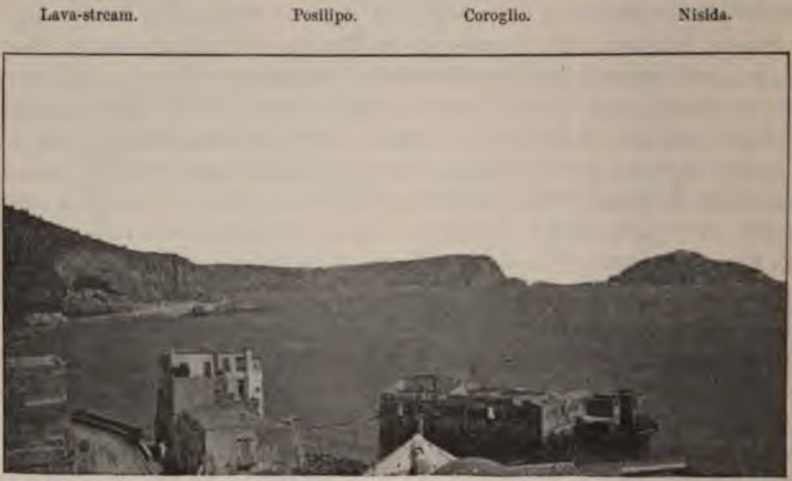

FIG. 17.—OSPIZIO DEI CAPPUCCINI, POZZUOLI.

(*From a photograph by Brogi.*)

All that remains of the hospice at present is literally in the water, and the wooden bridge out to it passes over the remains of a pavement which, though now more than a foot under water, was used a few years ago by persons entering the convent.

At various times the roadway between Pozzuoli and Naples has been undermined by the sea for a considerable length, although very strongly built and faced with solid masonry. The damage was attributed solely to stormy weather; but a sinking foundation was most likely an assisting cause. The new road has been constructed further inland at immense cost by cutting into the face of the old lava rocks, where they advance close to the sea, and forming breakwaters at other places of enormous blocks of that stone.

We may perhaps be permitted to repeat here the hydrometrical observations of Niccolini, made with a tide-gauge fixed in the Temple of Serapis, which was then in more open communication with the sea than it is at present. From October 6, 1822, to July 1, 1838, the land sank 4·3 inches, or from about 0·27 to 0·31 inch per annum; and from July 1, 1838, to July 1, 1845, it sank 5·6 inches, or at a rate of about 0·8 inch a year. Scacchi notes that in 1852 the water was not standing as high as in 1845, so that the land appeared to be rising once more (Roth). The observation may, however, have been due to the prevalence of a particular wind, which, as we have often observed, may produce a difference of water-level of a few inches. Guiscardi has noted a subsidence of the Bridge of Caligula of 0·349 metre in twenty-five years.

On account of fluctuations of sea-level due to wind and tide, it is not always a simple matter to make accurate observations of land-level, and records depending upon a single observation are liable to considerable error. In order to ascertain the mean tide-level, observations of the height of the sea were made during the summer of 1901, with a tide-gauge fixed to the quay of Villa Rosebery: we noticed a variation of as much as 16 inches in a few hours during spring tides. These observations ought to be repeated in a few years' time, in order to ascertain whether the subsidence is still continuing.

It is worth noting that Neapolitan engineers undertake a great work like the *emissario di Cuma*, a sewer 9½ miles long, and with a fall of only 0·65 in 1000, across a region which has been so subject to changes of level. Water has long ceased to flow along the ancient Roman aqueducts to Puteoli and Misenum: may not the earlier earth-movements have been the cause?

General Conclusions.

That the upward movements of the land in recent geological times have been much in excess of the downward movements, is shown by the occurrence of recent marine deposits on Mount Epomeo in Ischia, at a height of 500 metres above sea-level. When these deposits were in process of formation, the whole of the Phlegræan fields would have been submerged. The land did not rise continuously, but remained stationary at the levels now indicated by the sea-worn caves high up on the cliffs of Capri and of the mainland. The Lithodomus borings observed in the Tiber valley at heights of 276 and 268 metres (Suess) were probably formed about the same time. During this period of elevation, the sea-bottom was rent by the volcanic outbursts, which threw up the older craters of the Phlegræan Fields, and the sea carried the ashes far up into the valleys of the Apennines.

Later stages in the elevation are indicated by the deposits of sea-sand older than the Roman period upon Monte Olibano, at a height of 32 feet.* The upward movement continued until the land reached and passed its present level by some 20 feet at least. So far as our evidence goes within the historical period, the land stood at its greatest elevation at the time of the Greek colonization. That a slight subsidence may have been going on during the Roman dominion is indicated by the repeated incursions of the sea across the ancient Via Herculanea into the Lucrine lake and by the need of repairs to the Ripa, but that the land was still at a much higher level than it is now is certain. The fall of the land followed the fall of the empire.

In the dark ages the larger part of Amalfi was carried down by the subsidence and lost under a waste of waters. The upper groove of erosion was being etched upon cliffs and buildings in the thirteenth, fourteenth, and fifteenth centuries. The most recent elevation of the land occurred about the beginning of the sixteenth century, but was not great enough to lay dry the Roman foreshore, which is now for a second time slowly sinking beneath the waves.

Several facts, hitherto unexplained, are in accordance with the theory of subsidence. There is evidence that the banks of the Tiber are much lower at present than in ancient times, whereas the water in the river, depending as it does upon the level of the sea, has remained at its original level,† for Pliny (xxxvi. 104) speaks of Agrippa being rowed into the Cloaca maxima, the mouth of which it is now impossible to enter.

Further, a Roman mansion was discovered in the gardens of La Farnesina, which was decorated with magnificent paintings and stucco panels. The pavements of this noble mansion were only 8·20 metres above the level of the sea, and about 3 metres above the level of the Tiber. During the four months employed by Prof. Lanciani in removing the frescoes and panels, the Tiber entered the house five times. By the theory that the land is lower than when the house was built, these facts are explained.

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* Babbage and Sir Edw. Head in 1828; 12 metres (Suess).

† Measurements made at the marble wharf (*Marmorata*) and alongside the ancient embankments show that since the fall of the empire, the modern bed of the river has hardly risen 3 feet with reference to its banks (Observations of Padre Secchi in 1869 and of the engineers, reported by Prof. Lanciani).

And by the same theory we may explain the apparent rise of the subterranean water-level under Rome. On either side of the Via Poli the pavement of an ancient street was found under 2 feet of water; the cellars of the wine dock in the gardens of La Farnesina were flooded up to the key of their vaults in 1877, and many other instances are well known to the explorers of subterranean Rome.

On the other hand, the advance of the coast westwards at the mouths of the Tiber, at a rate which has been estimated at 9·20 metres per annum at the Ostia mouth, and 3·10 metres at the Fiumicino mouth, would at first sight seem to be in opposition to our theory of subsidence, were it not for the fact that the river brings down some 4,000,000 cubic metres of sand and mud per annum, and that the prevalent winds are from the south-west.

To return to the Phlegræan Fields, our theory explains why the Lago d'Agnano, a large sheet of water a mile in circumference in the seventeenth century, is not mentioned by any Roman writer, for with the land at a higher level, the drainage level of the country would be relatively lowered, and the Lago d'Agnano would not have been in existence.

And, finally, we wish to attribute to the same cause of subsidence the present unhealthiness of the low-lying plain of Paestum. We do not believe that a city containing some of the most magnificent Greek temples, and one which had reached the state of culture implied by the frescoes in the Naples Museum, would have flourished in the middle of a malarious swamp, the nursery of mosquitoes, and now abandoned to snipe and buffalo.

NOTE ON AN UNRECORDED SUBMARINE SULPHUROUS SPRING.

When bathing in calm weather inside the modern breakwater near the Capo di Posilipo, we noticed, on several occasions, the odour of sulphuretted hydrogen very distinctly at a particular spot near the middle of the harbour. The existence at this spot of a mineral spring of the nature of the *acqua solfurea* of Santa Lucia in Naples has, so far as we know, not been placed on record, although in a cave near by sulphuretted water has been pumped for many years. The source of the spring would have been above the sea-level in the Roman days, and would have been near the line of the ancient coast road. The exact position will be indicated in the map to our archæological paper.

REFERENCES.

Babbage, C.—'Observations on the Temple of Serapis.' 1847.

Bellori, J. P.—'Fragmenta vestigii veteris Romæ.'

Beloch, J.—'Campanien.' 2nd Edit. 1890.

Brauns, —.—'Das Problem des Serapeums von Pozzuoli.' Schriften der Leopoldinischen Akademie. 1888. [The author considers the Serapeum to have been an aquarium for marine fish !]

Breislak, S.—‘Voyages physiques et lithologiques dans la Campanie.’ Paris. 1801.

Cluverius, P.—“Italia antiqua.” Lugd. Bat. 1624.

Fazio, G.—‘Discorso intorno al sistema di costruzione de Porti.’ Napoli. 1814.
„ ‘Nuove osservazioni.’ Napoli. 1832.

Goethe, W. von.—‘Architectonisch-naturhistorisches Problem.’ 1823.

Günther, R. T.—“The Phlegræan Fields.” *Geogr. Journ.*, October, 1897.
„ “On the Possibility of obtaining more reliable Measurements of the Changes of the Land-level of the Phlegræan Fields.” *Scottish Geogr. Journal*, October, 1900.

Kopisch, A.—“Entdeckung der blauen Grotte auf der Insel Capri.” *Reclam. Univ. Bibliothek, No.* 2907.

Lyell, C.—‘Principles of Geology.’ London. 10th Edit. 1868.

Macintosh, Colonel.—“On the Ospizio dei Capuccini at Pozzuoli.” *Quart. Journ. Geol. Soc.*, vol. iv., 1847.

Mackowan, Captain.—‘Capri.’

Mangoni, R.—‘Ricerche topografiche ed archeologiche sull’ isola di Capri.’ Napoli. 1834.

Niccolini, A.—‘Descrizione della gran terma puteolana volgarmente detta Tempio di Serapide.’ Napoli. 1846.

Paoli, Padre.—‘Antiquitatum Puteolis, Cumis, Bais existentium reliquiæ.’ Napoli. 1768.

Roth, J.—‘Der Vesuv und Umgebung von Neapel.’ Berlin. 1857.

Suess, E.—‘Das Antlitz der Erde.’ Vol. ii. 1888.

Erratum.—P. 127, footnote: *For* St. Michele and St. Croce *read* S. Michele and Sta. Croce.

Before the reading of the paper, the PRESIDENT said: Our associate, Mr. Günther, was the last of our travelling students at Oxford, and when he was appointed he selected, as the region that he would examine, the country round the Bay of Naples. Since then he has continued his researches, and I think you will find from his paper that he has done some very excellent work. I will ask Mr. Günther to read his paper.

After the reading of the paper, the following discussion took place:—

Mr. J. J. H. TEALL: I think, sir, we must all agree that we have listened to a very important paper on a very interesting subject. It evidently contains a large amount of carefully observed facts, and it is coupled with a good deal of classical research. Indeed, what strikes me as one of the leading features of the paper is the way in which the author has brought all kinds of knowledge to bear on this problem, and has led up to some most interesting conclusions. I regret, sir, that I have no personal acquaintance with the district, and the very few remarks that I can offer must be based on second-hand knowledge. The last general discussion of the phenomena of the rise and fall of land on this portion of the Italian coast, with which I am acquainted, is that contained in Prof. Suess' well-known work. He refers to the three columns of the Temple of Serapis, and arrives at the conclusion that the oscillations, recorded by those columns, have taken place in the interior of what he calls the Phlegræan crater, and are comparable to the rise and fall of the lava-crust in the crater of Kilauea, or to the rise and fall of the ice-covering of a pond in consequence of the change in the amount of water in that pond. In short, he arrives at the conclusion that the phenomena are strictly local. Now, the paper that we have listened to seems to show very clearly that the phenomena are far more general than would follow from Prof. Suess' view; that we have not simply to do with the oscillations of land in a crater, but that we have to do with phenomena in post-Roman times which have affected a very considerable extent of coast. Indeed, I gather that Mr. Günther would connect the movements that he has described with those that have taken place as far north as Rome. I can imagine that there may be some doubt as to whether the coast along the whole line moved simultaneously; but certainly the evidence, as he has presented it, seems very strongly to point to that conclusion, and if so, then we have to deal with phenomena far more general than those contemplated by Suess, and we are led on to consider whether the movements along the Neapolitan coast are not movements analogous to those in Scandinavia and many other districts. Mr. Günther is strongly of opinion that these changes of level are to be attributed to changes in the level of the land, and not in any way to changes in the level of the water. He has proved quite clearly that changes in the level of the water will certainly not account for all the phenomena. The tilting of the upper erosion-line in the island of Capri proves, of course, in the most convincing way, that some movement of the land must have taken place. I can imagine, however, that Prof. Suess would claim, at any rate, a portion of the phenomena as being due to changes in the level of the sea, and on that point I certainly do not feel competent to express any definite opinion. Well, sir, the paper, as I said, is undoubtedly a most interesting contribution to a most important subject. We shall all study it, I am sure, with the very greatest of interest, and all future discussions, as to movements in relative level of land and sea, will have to take this communication into consideration.

Prof. BONNEY: My friend Mr. Teall has seized upon the salient point in this paper; it is that Mr. Günther has made perfectly clear what was a matter of doubt before. We all have known for long—at least 150 years—that there had been a depression and then a rise of the land in the immediate neighbourhood of Pozzuoli, but neither Lyell nor Reclus would venture to say positively that that was more than a local change, and there was a disposition to connect the subsidences and the rise with an eruption in the year 1538. Now, it seems to me that Mr. Günther has brought together such a mass of evidence of different kinds that he has proved this phenomenon to be not a local phenomenon, but one which affected very large areas of that part of Italy, so that, as Mr. Teall says, this paper takes us forward a distinct step. The movements up and down in the Bay of Naples take their place with other movements in other parts of the Earth's surface. One point in Mr. Günther's paper was distinctly news to me. I had always supposed it possible the coast might have been a little higher in Roman times, but I never realized that the evidence was so strong as it is that the land must have stood at least 17 feet higher in Roman times, and then have sunk to something like 18 or 20 feet below its present level, and afterwards, probably in the earlier part of the sixteenth century, have come up. In fact, we can fix the dates tolerably well. The so-called temple could hardly have begun to sink before the earlier part of the fifth century, and between that date and the earlier part of the sixteenth century the submergence, the boring into the columns, and the rising again must have taken place. This is a part of a very much wider-spread phenomenon. It has been asserted that since the first advent of our forefathers into the district of the lowlands of Europe there have been rather marked changes of level, and some even think that the coast of Holland, the coast of the north of France, and even the coast of steady-going Scotland, have not altogether preserved their level. It has been claimed that in the Firth of Forth there has been a slight change of level since the Roman times. It would be a very good thing if we could have a series of marks run across England from sea to sea; not that we should get the benefit of them, because for any one to do it for his own satisfaction would be something like that celebrated Greek who, when he was a very old man, having been told that a raven lived a hundred years, bought a young one for the purpose of making the experiment. The movements will be slow, but still we want some more definite evidence to see whether the level of the land remains as uniform as is supposed. There have been changes in South America and New Zealand, sometimes slow and sometimes quick; but in many parts of the Earth there are earth-movements which cannot be explained by mere changes of sea-level; in some cases they must certainly be changes of land-level. I think Mr. Günther has made it clear that, although the change in the level of the sea has had something to do with it, here in the Bay of Naples there has been also a change in the level of the land, and one that has affected a very large area.

Dr. H. Woodward: I do not think I can add anything to the remarks Mr. Teall and Prof. Bonney have already made on this very admirable paper. It is most interesting to find that a subject which was taken up by Mr. Babbage in 1828 has now been made use of as the text for a new paper to-night, and that around the Temple of Serapis, which was the original subject on which Mr. Babbage founded his paper, Mr. Günther has gathered a vast number of valuable and new facts which all bear upon the same problem. The importance of the Mediterranean seaboard for examinations of this kind is very apparent, because the effect of the tides on the coast is there less visible than on our own shores, for instance, where a great rise and fall take place, especially on the western side of England. But in the Mediterranean, where only a few feet constitute the mean between high and low water mark, these lines of old erosion, which stand at a height of 20 feet or more above the present sea-level, and are exact replicas of the marks which the sea is now producing on the sea-level, are of the greatest value to the geologist as evidence of an ancient sea-margin, and furnish an admirable record of the former height of the coast-line. On our own coast, we have not those records which mark the Bay of Naples in the shape of historical buildings which can be made use of, but we have many indications; for instance, in the submersion and erosion of the Channel islands and of the western coast of the Bristol channel, and many submerged forests along the coast which indicate in pre-historic times great changes of level along our shores. But the advantage of the spot which Mr. Günther has selected lies in the fact of so many important date-marks being found on the coast which fix the exact time and period in history during which the change of level has arisen. Of course, we have another factor in the Bay of Naples which is not to be appealed to on our own coast, that of the near presence of active volcanic movements and disturbances, so that that factor has to be taken into consideration in the changes which have been indicated in the paper that we have listened to to-night. Still, the importance to the geologist and to the antiquarian in the work which Mr. Günther has done cannot be overestimated, and some of the things which he has mentioned in his paper—all of which I do not think he read—with regard to the interior of those grottoes are of very great importance, because he takes the line of argument that those caves have not been eroded by water-action such as we are familiar with in the caves of Derbyshire and other limestone caves in this country, where fresh water has acted upon the rocks and has eroded the caves before they came within reach of the sea. In this case, Mr. Günther argues that the change of level of the sea has eroded the caves; that when the sea was at a high level it eroded the roofs of the caves, and when at a lower level it eroded the floor; and he has cited evidence of very great importance that in the Blue grotto there was formerly an entrance to one of the palaces above, which was actually accessible then, not as now by small boats, but by ordinary vessels, which could have reached the entrance of one of the old Roman palaces that stand on Capri above the cave. I am only recapitulating remarks which will be found in Mr. Günther's paper, and therefore I must apologize for detaining the meeting by further remarks; but I have been extremely interested both from a geological and a geographical point of view in the paper which Mr. Günther has read, and I congratulate the Society on having received so valuable a contribution.

Mr. D. G. Hogarth: I do not think, sir, that I can do very much more than congratulate Mr. Günther upon the success of his archæological evidence. This is not perhaps primarily an archæological question at all, and as an archæologist, when one has to deal with subsidences of the land, I am bound to say I have always feared the verdict of the geologist. On the present occasion, I think Mr. Günther has had emphatic confirmation from most distinguished geologists. Some part of Mr. Günther's evidence, particularly that part referring to plans of houses taken by the sea-telescope, would not, had it stood by itself, been convincing. It is always extremely difficult so to distinguish the ground-plan of the habitable part of a house from a ground-plan of foundations. When you cannot make out the walls, and still less clearly the doors, it is almost impossible to produce conclusive evidence that what you have been surveying is really a ground floor. I should say, having seen Mr. Günther's surveys, that he did find parts of houses once inhabited; but there are other facts which Mr. Günther did not dwell upon which were absolutely conclusive. There are flights of steps which are now a considerable depth below the water. You do not build flights of steps so that the top step is 6 feet below the surface. There was one point which he did emphasize, and that was the piers which have holes now several feet under water, and rings to which ships were once moored. Again I put it to the meeting, for what purpose could these rings have been put in their present position except for mooring vessels. These phenomena are to be found on a very large and interesting scale in Alexandria, where at present, as I found to my cost, not only has the water-level risen on the land to such an extent that all early Alexandria is now under water at the spring of the year, but there extends out into the sea, in what is not now the harbour, but was the old harbour, very large remains of buildings which are now entirely a-wash. It was there I tried to make a little experiment in submarine surveying. I only wish some one who had the patience and experience of Mr. Günther would go to Alexandria and examine the coast. There may be found, by the use of the submarine telescope, not only interesting ground-plans, but also interesting and artistic remains. I am thankful that he has brought to bear such a mass of evidence as to leave no doubt about the subsidences.

The President: I am sure the meeting has listened with great interest to Mr. Günther's paper, and I think we ought to congratulate him on his views having received confirmation from the eminent geologists who have honoured us with their presence this evening. As I listened to the paper, I could not help reflecting of what great value history, and especially archæology, often is in the solution of geological and geographical questions; and, further, I reflected on the importance of extending our knowledge of these phenomena of the subsidence and rise of the land in other parts of the world. I do not know whether Mr. Günther intends to continue these investigations elsewhere (at least in the Mediterranean I hope he does), but I do think that the collection of all evidence connected with this subject in other parts of the world—and I know that there is a large amount of evidence—would be most useful work. I hope that some of our young geographers will devote themselves to research of that kind. I am sure the meeting will wish me to convey to Mr. Günther a unanimous vote of thanks for the admirable and very interesting paper he has read to us this evening.

ON SPHERICAL MAPS AND RELIEFS.*

By Prof. ELISÉE RECLUS.

I AM very sorry to be obliged to speak in English, because it is a long time since I have had an opportunity of airing it, and so I am afraid that, having only crossed last night, I have not yet taken sufficiently to the English language to be perfectly well understood by you. But I will try to explain my models, and if I cannot explain them in English, then my French will come to the rescue.

I intend to speak on geographical education. I think we are all agreed that it is only by observation that we can really understand nature. And what comes out of nature? The comprehension of the surroundings of man, and afterwards the comprehension of man himself. It is not first by the use of globes or of maps or of any artificial means that we are to teach children, and not only children, but all other people; it is by the observation of nature. It is by working especially in nature; and if you work in nature you have two good things—first, health, and then science. And it is in this way that man commenced to learn. He did not know at first that the Earth was round, and it is only three thousand years since people commenced making maps. Not long ago a great scientist, a geologist and botanist, told me how thankful he was to his mother for teaching him to observe nature. "My mother," said he, "was very poor in science, but still she observed, and she made me look with wonder at the little rivulets in the gutters; she showed me also the little glaciers on the roofs of the houses, and it is thus that I learned some very important phenomena of rivers and of glaciers." Well, it is in the same way that we are to learn, and it is the way that will make the most lasting impression, because, as I have already said, your scientific knowledge is not acquired by artificial means, but by observation of facts. The time, however, comes when you are obliged to use maps, but at the outset I think maps ought to be entirely tabooed. They must be tabooed, because maps are made on different scales, and that being so, it is quite impossible to compare them; and if you cannot compare them, it is only waste of time and trouble. I do not believe there is a geographer in the world—I do not know of one—who is quite conversant with the different scales of the various maps. We who have a certain reputation as geographers have just the same trouble as other people, because when we study distant countries on various maps—take, for example, Java and the Netherlands—the maps of Java are always small and the maps of the Netherlands are large, and therefore it causes a great confusion in one's mind. Therefore, in all well-conducted schools, globes should be used, and children ought to be entirely forbidden the use of maps. It is by the reproduction of nature that we learn; and as the child will learn sooner or later that the Earth is round, then you should show him something that is round as the Earth is. I think, in England generally, if you speak of the "use of the globes," it seems to call to mind the period of the Renaissance, when people used globes for the teaching of geography much more than we do now. In pictures of the sixteenth and seventeenth centuries, for example, when a learned man is portrayed, you generally find he has a globe near him. Now this use of the globe is much less general than it was at that time, and maps and atlases have taken its place. Globes were usually from 1 foot to 1½ foot, and sometimes 2 feet in diameter. Of course the scale was not accurate, because people did not know exactly what was the roundness of the Earth. The scale was generally 1 : 25,000,000, or from 1 : 30,000,000 to 1 : 40,000,000. But now we think that, as the circumference of the Earth has been pretty accurately calculated, it is convenient to have globes with a fixed scale, about the same size as that which was used generally by all the learned men of previous centuries, because they were easy to manage. Well, this one is 1 metre in circumference, with a scale of 1 : 40,000,000. If you want larger proportions, then you can have the proportion of 1 : 20,000,000, and then the globe will be 2 metres in circumference. If the globe is 4 metres in circumference, the scale will be 1 : 10,000,000, but globes of 4 metres in circumference are too cumbersome, and you are obliged to suspend them from the ceiling, and so they are perhaps a little difficult to manage in a school. Therefore it is absolutely necessary to adopt some other method, but always keeping the idea of the globe in mind, because you must always keep to truth. When you make things illusory—well, at the same time you make them treacherous. When people do not quite understand, but imagine they do, then their judgment is not reliable. And so if you want to represent something which is round, you must do so with something which is round. To show a globe of huge dimensions is impracticable, but you may at least show a slice of the Earth, a slice of the superficial part of the Earth, and the effect is the same. And so, for example, if you want to make a globe in the proportion of 1 : 5,000,000, it would have to be 8 metres in circumference, dimensions which are too large for an ordinary room. If, however, you cannot have the whole globe, you can have slices of it, and then you can see places as they are. And in this way you can make the child understand. The world is round, and he sees it round as it is. And if you want to show the globe entirely, this being in the proportion of 1 : 5,000,000, you have nearly 150 of those slices to complete the whole globe; but most of the Earth being covered with water, about 50 of those slices would represent all the continents of the world, while the remaining 100, representing the water, would be less useful. But you must keep this in mind, that as your slices of the globe are only in the proportion of 1 : 5,000,000, it is absolutely impossible to show the relief otherwise than by colours or shades; true relief begins to be visible by slight asperities only when the proportion is from 1 : 1,000,000. If you teach geography after this method of globular slices, you can be quite sure that there will be no hindrance to the intelligence of the child. He will perfectly follow all your reasonings and understand everything, because he sees the roundness of the Earth.

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* Read at the Royal Geographical Society, April 2, 1903.

Now let me pass to another subject. There is in Germany a certain divergence of opinion among teachers of geography about what they call "Einheit-Atlassen." I understand that this word applies to the same model being put in the hands of all pupils. But I thought to myself, when I first heard of them, that these atlases contained maps all constructed according to unity of scale, which would be indeed a splendid achievement. Proctor produced such an atlas about fifty years ago, but without great success; people were not yet prepared to the grand idea. In maps which do not accord with the principles of unity, but are made according to thirty or forty different scales, it is quite impossible to compare satisfactorily the various coasts, countries, and parts of the world. Proctor's atlas is comparatively a very small book, but it is a treasure, and I think it ought to be considered as one of the most important contributions to the teaching of geography that has been made. It was an excellent idea, and it will always have its admirers, but it has not made the way in education it ought to have. I think it is absolutely necessary to renew his idea, and we ought to have what I may call an isometric atlas—that is, an atlas in which all the maps are drawn to the same scale. With maps drawn to different scales, you never can say, "Well, I know that the proportion here is ten times larger, and therefore, of course, it is ten times larger in longitude, and also ten times larger in latitude, and so altogether this map is a hundred times larger than the other." If you have one map drawn to a scale of 1 : 30,000, and another 1 : 50,000, and another 1 : 70,000, and another 1 : 350,000, it is impossible to get out of the tangle—quite impossible, and so I say the education of children is quite biased.

Well, if we are of the same opinion on this subject, let us go further to an important question, that of the "typical" reliefs. For example, I would reproduce Mont Blanc in relief with the proportion of 1 : 100,000. Then the mountains would be about 4 centimetres above the plains. Of course the height would not be increased more than the breadth or length of the country; it would exactly conform to truth itself. This is a point I have contested with many relief makers. I think they are wrong when they show a relief which is not true in proportion. It is absolutely necessary to have an idea of geological shape; it is therefore necessary to know the slope; but if you heighten the slope twice, thrice, four times, or ten times, it is impossible for you to imagine the reality—the thing is made false in your mind, and so no reasoning can be connected on the true shape of the country represented. If you want to show the truth, you must give the proportions exactly as they are in nature. If you want to represent Mont Blanc, in the proportion of 1 : 100,000, you will see exactly the shape of the mountain and the valleys which surround it, and also the proportion of one part to another. The same observations might be made with regard to any other mountain. You might construct a model of the Jura, or the mountains of Wales and Scotland, or you might construct a model of Gibraltar or the Cape of Good Hope, all true to nature. But there is a very great difficulty with regard to ordinary reliefs, because they are cumbersome and difficult to construct; they have to be modelled, and, being made in plaster, require careful handling. It would, therefore, be much better if you could make them of some other material, and if, instead of moulding them, which is difficult, and renders the thing exceedingly costly, you could stamp them out of sheets of metal like this (referring to model). For two or three years a very skilful draughtsman, Mr. Patteson, the son of an English artisan, who went over to Belgium, has been doing this. He is a good craftsman, a good mechanic, and also a mathematician, and when he had worked at the problem for some time, he found out a method of producing the printed relief as it is wanted. This particular relief (referring to model) represents one of the most precipitous parts of Belgium. We might have found more precipitous places in Switzerland or in any other country, but living in Belgium, we preferred to take an example near our own place. The great point was to discover some method of printing on an uneven surface. As you know, it is only possible till now to print on an even surface. Very well, this is printed on an even sheet of metal, but it has to be printed in such a way that when the sheet of metal has been forced by hydraulic power into the various forms, the different points will be in their true geographical position. So you see it was a very difficult task, because it was necessary to find a geographical formula by means of which every point would finally occupy its correct position. Everything has to be drawn in the first instance, not in its true position, but in a false position, in order that it may be forced into its correct place. If this model is examined carefully, it will be found that every point is in its true position. I am very pleased to be allowed by Mr. Patteson to offer this first example to the Royal Geographical Society of England. Some metals are not suitable for this kind of work; for example, zinc would be torn to pieces by the great pressure, which is about 80 tons : this is of the best red copper ; aluminium might be used also. I do not know very much about the financial part of the business, but I know these models will be handier and more resistant ; they will be a good deal cheaper than the ordinary reliefs, and therefore I hope they will be used in all schools.

Before the reading of the paper, the PRESIDENT said: We are always very glad to welcome so distinguished a geographer as our Gold Medalist, Monsieur Elisée Reclus. We are always sure, whenever he addresses us, of having something most interesting and important to listen to. To-day he has promised to give us an account of the relief and other maps which have been lately, I believe, invented for the purpose chiefly of education. I will ask Monsieur Reclus to explain the maps to the meeting.

After the reading of the paper, the following discussion took place:—

Mr. MACKINDER: I need hardly say that I have listened with the same pleasure that I am sure every one in this room has to our distinguished brother geographer from across the sea. M. Reclus has been at work on these new cartographical methods, as I happen to know, for some years past, and I may say that we already have at Oxford a copy of the map of the western portion of the Mediterranean, which I see here exhibited as a sample. I would like, if I may, to take this opportunity, when so many who have influence in the matter of geographical teaching are here present, to urge that in connection with our new public authorities, we should try to convince people that in order to teach geography properly, it is necessary to spend more than has been spent upon material. For young children especially, good and abundant material is very important. It is true that these models of M. Reclus will cost far less than the old plaster models. Obviously they are much superior from other points of view. I take it they cannot be damaged so easily, and that they can be stored much more easily. But when all is said and done, you will still have to pay considerably for apparatus. At the present time there is a great tendency to employ, in the way of maps, the cheap and nasty. This is partly due to the comparative rarity of critical knowledge as to what is a good and what a bad map, but also partly to the fact that people have not appreciated the damage done to the minds of the pupils if the apparatus is bad.

There are only two other points I should like to put to M. Reclus. I venture to say that what we most want are some convex maps of larger portions of the surface of the globe. We want our students to grasp, for instance, the true form of the North Atlantic. That is an exceedingly difficult thing to drive home, and a false image of it early impressed on the mind has all manner of bad consequences later on. The relative distances across the Atlantic in different latitudes are obviously hard to appreciate when the map is printed on the flat piece of paper. Again, take British North America. The British dominions there must on the flat be either distorted or exaggerated. What we want is a map on the round of the whole of North America. I know M. Reclus may reply that we have globes for this purpose. But the globe is cumbrous and costly; it cannot be hung on a wall conveniently; it has to stand on a table, and is difficult to use with a class. Personally, I feel that for teaching, the most valuable adaptation of these globular maps would be to replace for many purposes the globe itself.

Now, with regard to reliefs, there is one point that appeals to every one who has to do with a plaster model: it is this—that you are looking at the scenery from the bird's-eye point of view; you are looking down upon it, whereas you look ordinarily at scenery from alongside—horizontally, if I may so put it. I cannot help feeling, therefore, that a certain exaggeration may under most circumstances be allowed. Let us consider, for instance, a model of the Alps and the Plain of Lombardy, a very important region in historical teaching. I agree that a well-made map of this region on the flat will of course mean a great deal to a geographer, but I find from experience that most students who examine even an imperfect model of such an area, carry away a vivid impress [illegible] would obtain from no map. Yet if you represented that region of the Alps and the Plain of Lombardy on the true scale, you would not get a sufficient relief to produce any effect. We must beware of becoming purists in this matter of cartographical truth. After all, the model is rather a weapon of teaching than a means of investigation. In schools time is limited, and you must be content with producing an impression of relative truth and producing it quickly, and afterwards the fact of exaggeration can be separately impressed. Of course, I am not now speaking of models of quite small areas like the Cape peninsula, which can be represented on the same vertical and horizontal scales, but rather of relief maps.

It is quite clear that M. Reclus with Mr. Patteson has got hold of a method which admits of rapid and accurate multiplication of models by means of hydraulic machinery and of a great reduction of cost.

Mr. **Ravenstein**: I am sure we are all delighted to see so distinguished a geographer as Prof. Reclus amongst us in what apparently is perfect health and in such excellent spirits. I have but little to say on the subject before us, because Mr. Mackinder has anticipated me in many respects. The scale of the maps of the continents in all our good school atlases is identical. But as, for educational purposes, we require maps of particular portions of the Earth, and often of certain towns, we must necessarily introduce other scales, which bear, however, a definite proportion to the scale of the general maps. Multiplicity of scales ought, of course, to be avoided. Now coming to relief maps, and to globes especially, I thoroughly agree with Prof. Reclus as to the system on which geography ought to be taught. There is no better method than the so-called *Heimatkunde*, which teaches a child by personal observation of geographical features. We geographers claim the Earth as our domain. Geologists and botanists may claim a particular kingdom of the Earth, but we claim the whole, and therefore on our school excursions we do not teach our children to look only at the shape of the land; for when a child asks the name of a plant, and why some plants are confined to marshy soil and others to the dry uplands, we cannot tell the child that this is not geography, and send it to some other teacher for information. Our children ought to be trained to observe all things. It is very curious that when I was a boy I read a good many advertisements—they were mostly from ladies' schools, and I think the ladies are sometimes far in advance of us in this respect—in which it was stated that "the use of the globes" would form one of the subjects taught. But where are globes used now? I think the equipment of no school can be considered complete without a globe. No man who calls himself a geographer, or who claims some knowledge of geography, and wants to read his newspaper intelligently, ought to be without a globe on his table. It is one of the most useful things; there is no apparatus like it. You can measure long distances on it, and there is no map on which you can do the same except in a roundabout way. Now, coming to models, I may remind Prof. Reclus that more than sixty years ago my own father, in conjunction with Bauerkeuer, introduced a method of producing cheap reliefs by embossing maps printed on paper. More recently Major Cybulz and others produced beautiful reliefs by a galvanoplastic process; these, however, had to be coloured by hand, and were consequently expensive. I must admit this, that the method of producing models recommended by Prof. Reclus yields results which are superior to anything done hitherto. I certainly think we ought, in every school, to have a number of typical relief maps, and if these typical relief maps are done on a large scale, we might in most instances do without exaggerating the vertical scale, because they could be taken up in the hand and the relief could be studied from different directions. But in addition to these large-scale reliefs, we are to have those discs which M. Reclus promised us on a former occasion, and which would include entire continents or larger surfaces of the sphere, and if those discs are to show the relief of the ground, then I do agree with Mr. Mackinder that we ought to exaggerate the vertical scale. If you look at Signor Pomba's beautiful model of Italy, now at the South Kensington Museum, and upon which there is no exaggeration of the vertical scale, you can certainly trace the Alps, and they do not impress you as constituting that formidable obstacle between north and south which they constitute in reality. I do think that if Signor Pomba had exaggerated his heights, his relief would have been more effective. And if this applies to the Alps, how much more would it apply to our hills in Wales or Scotland? They would almost disappear, and we should gain no correct notion of their actual height, and the formidable labour required to climb some of them. We all feel grateful to M. Reclus for having once more brought that important subject before us.

Dr. HERBERTSON: We are all very much indebted to Prof. Reclus for bringing these curved maps and models, which Mr. Patesson has constructed under his direction. A year and a half ago M. Reclus was good enough to present one of the curved maps to the School of Geography in Oxford, and I have constantly used it. It seems to me we cannot exaggerate the importance of having a collection of uniform maps constructed on a spherical surface such as M. Reclus proposes to make, more particularly for reference purposes.

In connection with the question of the scale of models, it seems to me that we ought, as far as possible, to have models, not merely with the true vertical scale, but also with exaggerated heights; just as in making a section through a country we draw it first of all on a larger scale to show details, and then reduce it to obtain the true slope. If we take the Thames basin, for instance, it is quite impossible to make a model on the true scale from the 1-inch map. For many purposes a model of the Thames basin on the 1-inch scale is valuable, but in order to make one we have to exaggerate the heights considerably. In teaching the morphology of the land it is necessary to use every possible variety of material, especially for regions which students cannot see—maps of all scales and models of all scales. Every different way of representing the land's surface has a certain merit, and serves to show some detail in a better way than others. It is only by comparing various methods of representing the surface of the land that we come to have a true conception of it. The typical models at a cheap rate will be a great boon to all teachers of geography, and I thank M. Reclus for showing us the beautiful specimens of maps and models which he has brought to-day.

Prince KROPOTKIN said he thought the models which M. Reclus had brought were certainly a great step in advance in the real teaching of geography, and anything which would tend to produce such models at a cheap rate would be another step in helping to spread a true knowledge of geography. With regard to the question of whether such models ought to be made true to scale, he pointed out several of the drawbacks which models with an exaggerated vertical scale were offering for the spreading of correct ideas concerning geological phenomena (glaciation, etc.); but he agreed, also, with Mr. Mackinder and Mr. Ravenstein as to the necessity of having two different sorts of maps. How would it be possible to represent, for instance, the plateau of the great continent of Asia, 3000 feet high and 2000 miles wide, if they were not allowed to exaggerate the vertical scale to a certain extent or even to a great extent—even so much as ten times? Again, in Kent, a difference of 100 feet in the altitudes sometimes made all the difference between the healthy ground of the plateau and the unhealthy clay of the lower levels; it must be shown on a relief map; and if it was intended to represent Kent on a scale where 100 by 300 feet would be a noticeable feature, it would be necessary to increase the size of the relief-map beyond all bounds. The vertical scale has thus to be exaggerated. But as a corrective to that, after having shown a model on an exaggerated scale, they ought immediately to show one true to scale. He thought maps constructed both on the real scale and the exaggerated scale ought to be found in every well-appointed school. When so much money was spent on useless things, such as ironclads and the like, surely they ought to be able to find the money for what was absolutely essential in carrying on the work of education! He was also very much in favour of the wider use of globes. Children and students ought to have something which would really represent the Earth. It had been urged that globes were expensive. Well, so long as the demand was small they were likely to be expensive, but let the demand be great, and there would be hundreds of inventors ready to supply well-made globes at a comparatively small cost. In conclusion, he congratulated M. Reclus on his perseverent efforts in obtaining true representations of the Earth's surface, and Mr. Patesson on having made the discovery of a practical method for making relief-maps.

Mr. ANDREWS: There is one lesson which I think is more important than any other that we can draw from the excellent exposition M. Reclus has given us, that is to try to get as near as possible to nature. In early days we were content merely to look at shadows, like Plato's prisoners in the cave; now by means of pictures and accurate representations of the Earth's surface in different forms, we are trying to get some idea of what countries are really like, and when we deal with history we try to realize the character of the passes or of the regions through which armies marched, and of the various difficulties and obstacles that lay in their paths. Now, this attempt to get near first-hand knowledge seems to me to be the root of the matter in geographical success. There is still a tendency to make geography merely a record of statistical information. I think that we try to do a great deal too much—that is to say, that we make a mistake in trying to cover the whole area of the world. It would be very much better if we first of all worked out more thoroughly certain detailed areas. We forget that what we have to teach is not statistics, but a method of understanding geographical information which will enable students to use other factors and data when they come before them in their after-career. Therefore I think what M. Reclus has said this afternoon, and what he has shown us in these most admirable maps, should be very valuable from this point of view, if it also enforces the lesson that to get more first-hand knowledge and to study in greater detail a small portion of the world, and to understand the relations of the different phenomena in that district—such as, to take an instance, mountains and forests, and their connection with life and history—is of more value, and will help more to form a habit of thought, which should be the aim of our geographical teaching, than to look at shadows all over the world. I have nothing more to add except to emphasize this very important point, the treatment of some part, at any rate, of our work, the study of a small area in a more detailed manner. I can only thank M. Reclus for his most valuable and interesting exposition.

Mr. COBDEN SANDERSON: I only wish to intervene for one moment. The gentlemen who have hitherto spoken have, I think, been all geographers conversant with the subject and with matters of geography fully in their mind. I beg to speak as a layman in this matter, and as a layman to thank M. Reclus not only for the construction of these maps and for his contributions to geography proper, but as an inspired teacher of geography, who shall not merely communicate to us knowledge of the facts, but shall excite our wonder and admiration for the world itself, which is the subject of geography. It is for that contribution to human knowledge and human aspiration that I beg as a layman to thank M. Reclus for his life-long contribution to the great work of humanity.

Prof. Reclus: I have to thank you, and especially Mr. Mackinder and Prof. Ravenstein and Dr. Herbertson, for what you have said with regard to the usefulness of globular discs, and especially of those which would represent a large part of the Earth's surface. I speak here, not as a geographer, but as an artist; and I think nothing would be more wonderful than to have a model of very extensive parts of the Earth, with the real curvature and the real proportion shown, in such a place, for example, as this hall of the Royal Geographical Society. You would then have an opportunity of seeing the whole of the globe as well as the various parts. It is very difficult when you see only Spain and the South of France, and the western shores of the Mediterranean, for instance, to realize that it is only about 150th part of the Earth. That is because the curvature is very small; but with the curvature very large, you would immediately say this is a tenth or a twelfth or a fifteenth part of the surface of the Earth, and so would get a clearer idea of the relative proportion of that part of the country with which you were dealing. I think the idea is to be realized, and I thank you for having hinted at it. But now another thing—the real and vertical scale. I do not agree with the remarks of all these gentlemen, although I think it is necessary sometimes to exaggerate in scientific demonstrations. For instance, if you want to show the different tracks for the tunnelling of the English channel between France and England, you would not see the mere line which is made by the sea, and so you are obliged to deepen that ditch between France and England, and to show that it has a certain depth you are obliged to exaggerate. There are occasions in teaching where exaggeration is absolutely necessary. But then I think it would be better to have the two things, to have the exaggeration which could be shown on the map, and the true line to show the true state of things. Now, some one referred to that beautiful map of M. Cesare Pomba. I am a great admirer of it, and I think it is a very good idea to show Italy with its true curvature and the Alps in their true proportion. When we see them on a model in their true proportion, we are generally astonished, and perhaps say, "They are not very high; I thought they were higher. When I am in Milan or Verona and see them before me, they seem so majestic; of course they must be higher than that." And so we lose our illusion. But I think the reason for this is because we have had a bad education. For example, in certain atlases we see France with its mountains, and not only the Pyrenees and Alps, but also the mountains of the interior, and they are shown in such an exaggerated way, in proportion of one to five or more, and then we say: "How splendid, how well-shaped that relief is! that map is very nice." But it is false; and taught by that, you are led to think that nature has more relief in reality than she has. I think we ought to keep as much as possible to the truth, and if relief is not sufficient to show itself, then let us represent it by a difference of colour. For example, in this map of Spain we have tried to show all the heights from 1000 to 3000 metres and more by a difference in colour, because it is impossible to represent them by real relief. I think there are two schools, one of perfect truth, and the other with a certain condescension towards the illusions. Well, I think this second school is not the good one. As a descendant of the old Huguenots, I prefer sticking to truth.

The President: I think, before I ask you to pass a vote of thanks to M. Reclus, I ought to say that we as a society are bound to further the views which we believe to be correct, and which M. Reclus has expounded to us now on two occasions when he has been so kind as to pay us visits here. He has impressed upon us the importance of the use of globes, and the importance of teaching by means of globes. He has reminded us that in the days of the Renaissance they were universally used. Sir Francis Drake and Cavendish and

Frobisher certainly took globes like that to sea with them, and puzzled out their problems on the globes, and it is far easier to understand problems in geography by using a globe, than by drawing imaginary spherical triangles on a plane surface. I understand from Mr. Reeves that he has now introduced the plan of teaching nautical astronomy and the problems of geography by means of globes. M. Reclus has pointed out to us the importance of these relief maps, to enable us to understand that we are looking at a rounded and not at a plane surface. And then with regard to the larger-scale maps, he has, after much thought, adopted Mr. Patteson's plan of using metal and printing on it, instead of the old plan of moulding. These improvements are all very important for educational purposes, and as he has most kindly, as I understand him, presented our Society with these two models, it will be our endeavour to make his plan known as widely as possible amongst men engaged in education, and so we trust that this immense improvement—and it certainly is an immense improvement—in the method of teaching geography will gradually be introduced into this country, and that a large demand will arise for these relief maps. I would ask you to pass a vote of thanks to M. Reclus for his great kindness in coming over here to address us, and for bringing with him these maps for our instruction and use. I ask you to pass a vote of thanks by acclamation to M. Reclus.

ANTARCTIC SLEDGE TRAVELLING.

By the PRESIDENT.

THE great work of the Antarctic Expedition was achieved by sledge travelling, and the clearest way of giving an idea of the extent of this work is by presenting it in tabulated form. The autumn travelling occupied from February 18 to April 3 under most rigorous conditions of climate.

The spring travelling comprised two main expeditions to the south and inland to the west, two supporting parties, and one depôt party.

There were also ten reconnoitring parties to explore the region nearer the ship. Five went out in the intense cold of the early spring—one towards the mainland to south-west, another towards the mainland to west, and three to examine the island of the volcanoes. Of the five later parties, one was to Cape Crozier, another along the west side of Mount Erebus, two to the land to the south, and one to explore a smaller volcanic island. Altogether eighteen sledge parties.

AUTUMN TRAVELLING.

Date.	Officers.	Men.	Temp.	Days.	Remarks.
Feb. 18-22	Shackleton Wilson Ferrar			5	To the island 15 miles south-south-west. Ascended peak of island, 2720 feet, and found clear road to the south. Returned with considerable information as to the lie of the land.

Date.	Officers.	Men.	Temp.	Days.	Remarks.
March 3-20	**Royds** **Skelton** **Koettlitz**		−42°	17	To go round Mount Terror. Captain was going, but he sprained his knee. Eight dogs. Snow very soft. March 7, Barne went back with men, the other three proceeding on ski; but unable to reach Cape Crozier.
March 3-12	**Barne**	Evans Quartly Wild Vince Hare Weller Heald Plumbley		9	Barne reached crest of hills on March 11. Heavy gale and drift. Party left the sledges and made for the ship. Vince fell over precipice into the sea. Hare under snow for thirty-six hours. Rest found their way to the ship.
March 31 to April 3	**Captain** **Wilson** **Armitage** **Ferrar**	Dellbridge Macfarlane Walker Blisset Feather Smyth Allen Williamson	−40° −48° −57°	4	Loads too heavy. Four sledges and eight dogs. Only got 7½' from ship. Cold intense. With twelve men and the dogs. Dogs all refused duty. Two sledges and nine thermometers left behind. Men suffering severely after reaching barrier surface. Too cold for camping out. Object was to place a depôt, but decided to return.

Autumn travelling was first undertaken, in polar work, when McClintock was away from October 2 to 10; Aldrich, October 2 to 6; and Mecham 5 days, laying out depôts in 1850. In 1875, in the same month, Markham, Parr, and May were away 21 days, Aldrich 13, and Egerton 4. It is excessively severe work.

Scott considers the autumn journeys to have been useful because they gave experience, and when the spring came he felt that he "could not be sufficiently thankful that most of us had had an opportunity of spending a few days in the autumn travelling." The furious gales and very low temperature made it more severe work than in the Arctic autumn travelling.

MAIN SOUTH JOURNEY.

Depôt Party.

Date.	Officers.	Men.	Temp.	Days.	Remarks.
Sept. 17-19 Sept. 23 to Oct. 4	**The Captain** **Shackleton** **Barne**		Heavy gale, −51°	10	With the dogs. Such a hurricane that they had to return on 19th. Barne badly frost-bitten.
	Shackleton **The Captain**	**Feather** (*boatswain*)			Started again on the 23rd. To **Depôt A**, 60 miles south of the ship and 8 miles from the land, 79° 45' S.

Supporting Party.

Date.	Officers.	Men.	Temp.	Days.	Remarks.
Oct. 29 to Nov. 24	**Barne**	Feather Dailey Crean Handsley Joyce Kennar Smyth Weller Williamson Pillbeam Buckridge		26	Accompanied the main party to **Depôt A**, Nov. 11. Return journey Nov. 15–23.

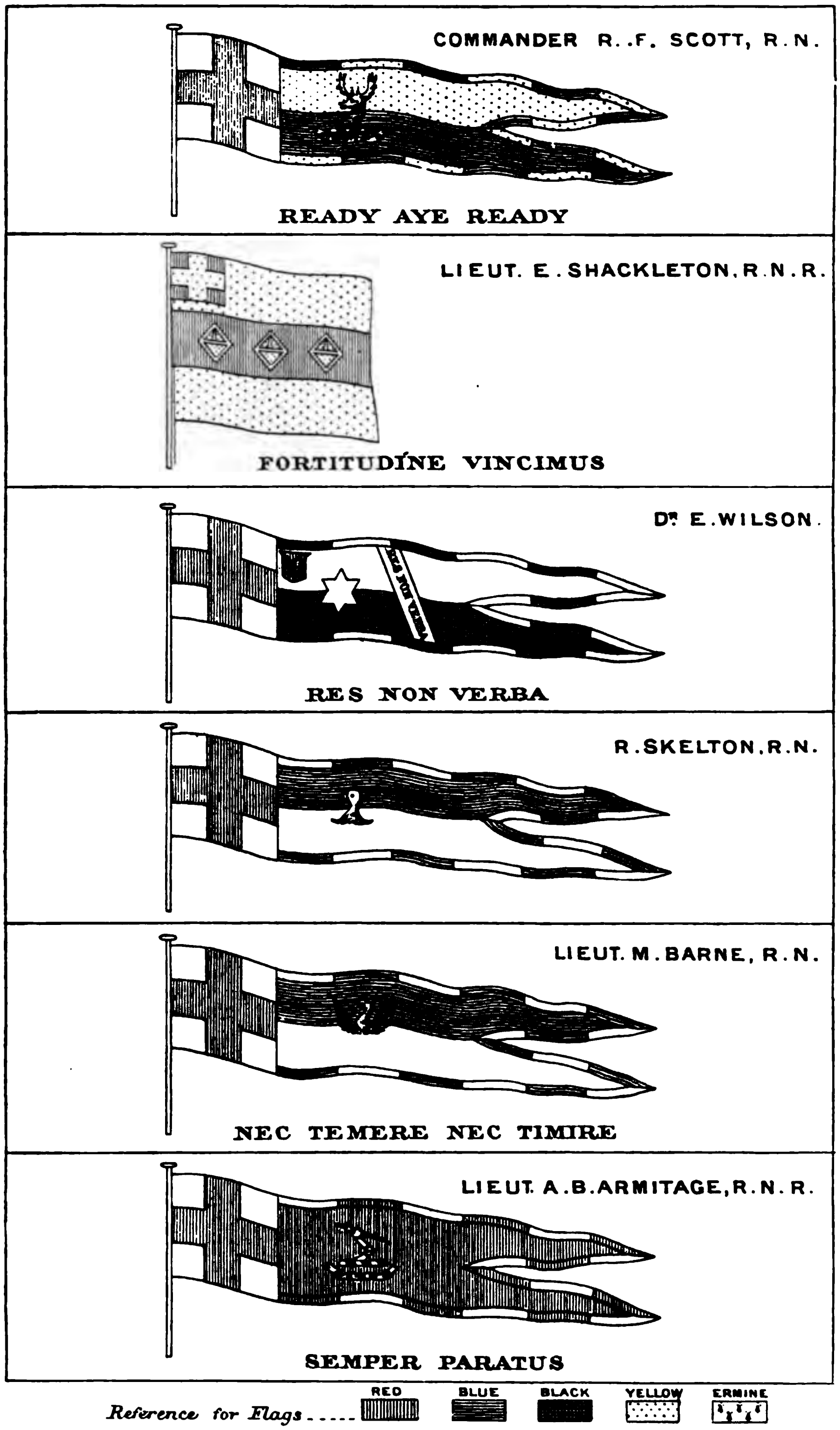
Main Party.

Date.	Officers.	Dogs.	Temp.	Days.	Remarks.
Nov. 2 to Feb. 5	**The Captain** **Shackleton** **Wilson**	1 *Snatcher*, *d.* Dec. 9 2 Vic „ 16 3 Wolf „ 19 4 Granny „ 20 5 Brownie „ 26 6 Clarence „ 31 7 Spend, *d.* Jan. 1 8 Nell „ 2 9 Guss „ 3 10 Bismarck „ 4 11 Boss „ 5 12 Kidd „ 5 13 Birdie „ 10 14 Joe „ 10 15 Lewis „ 11 16 Nigger „ 15 17 Jim „ 15 18 Blanco 19	−30°	94	All the dogs, but they began to fail on Nov. 15. Nov. 16 to Dec. 16, relay work in soft snow; 15 miles for 5 made good. Dec. 16, **Depôt B**, 3 weeks' provisions. Went south with 4 weeks'. 80° 30′ S., 162° E., 7 miles from a headland. Dec. 30, reached **82° 17′ S.**, 163° E. Attempt to reach land. Jan. 1, dogs useless. Jan. 9, dogs unharnessed. Jan. 13, two days' provisions left. B. Arrived depôt B. Jan. 15, breakdown of Shackleton. Scott and Wilson pulling **270 lbs.** each. Jan. 28, **Depôt A.** **853** geographical miles. **973 stat. miles.**

MAIN WEST JOURNEY.

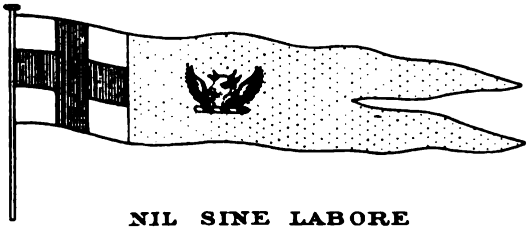
Supporting Party.

Date.	Officers.	Men.	Temp.	Days.	Remarks.
Nov. 29 to Dec. 18	**Koettlitz** **Ferrar**	Hubert Dell Whitfield Clark Dellbridge Croucher		20	To accompany the main west division for ten days. Turned back December 9.



SLEDGE FLAGS OF THE

Dr. R. KOETTLITZ



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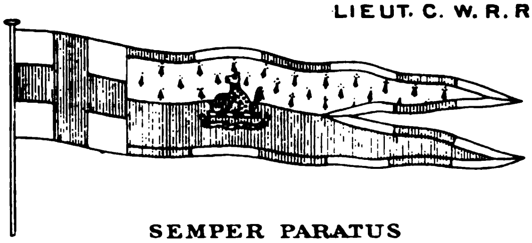

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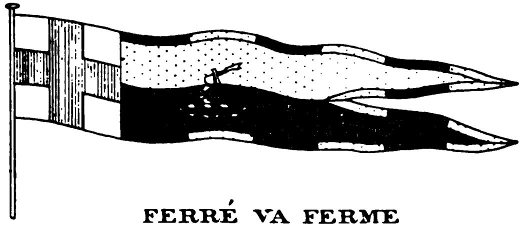
H. J. FERRAR



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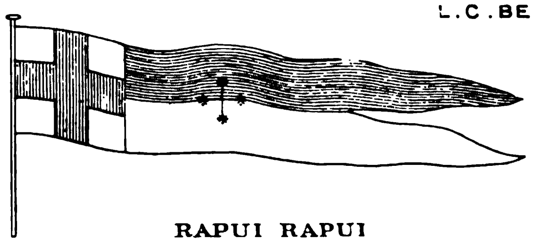

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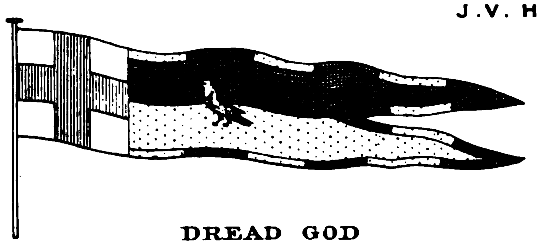

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Reference for Flags ----- RED ▥ BLUE ▤ BLACK ■ YELLOW ⬚ ERMINE ▢

"DISCOVERY" EXPEDITION.

Main Party.

Date.	Officers.	Men.	Temp.	Days.	Remarks.
Nov. 29 to Jan. 19	**Armitage** **Skelton**	Evans Macfarlane Gilbert Scott R.M. Walker Quartly Allen Handsley Wild Duncan Buckeridge		53	Dragging 240 lbs. per man. 29 miles over sea-ice, then 19 miles up a snow-filled valley to the foot of mountains 11,000 feet high. Had to work by relays; 4500 feet. A week trying to ascend a mountain. Descended 2000 feet on to a glacier, then always ascending for the next 50 miles, with crampons. Left six men at 8000 feet, sick from altitude. Reached 9000. Officers and four men. Jan. 6, 38 days out; 14 days returning. 141·5 stat. miles from ship (122·7 geographical miles), 77° 21′ S., 157° 26′ E. 537 stat. miles.

EARLY SPRING PARTIES IN EXTREME COLD.

Date.	Officers.	Men.	Temp.	Days.	Remarks.
Sept. 2–7	**The Captain** **Shackleton** **Skelton** **Wilson** **Ferrar**	Feather	−50°	5	With fifteen dogs: to examine the bay and islands, and the glacier north of winter quarters.
Sept. 10–19	**Royds** **Koettlitz**	Lashly Quartly Wild Evans	−52° Heavy gales	9	Attempt to reach mainland to south-west, and explore Mount Discovery.
Sept. 10-24	**Armitage** **Ferrar**	Cross Heald G. Scott, R.M. Walker	−45	14	To reach mainland to west. Came to a glacier on the mainland, and ascended it. Came back in a broken-down condition: Ferrar, Cross, and Heald with scurvy. Ferrar's life was saved by Heald.
Sept. 24 to Oct. 2	**Koettlitz** **Bernacchi**	Dailey		8	To Brown and Black islands.
Oct. 4–25	**Royds** **Skelton**	Evans Lashly Quartly Wild	−40° every day; once −58°, lowest recorded while travelling. Furious gale 5 days	21	To Cape Crozier. Skelton, roped with men, made a wonderful descent to the sea-ice. Found the record. Royds suffering from cramp.

EXPLORING PARTIES IN THE SUMMER.

Date.	Officers.	Men.	Temp.	Days.	Remarks.
Nov. 3–20	**Royds**	Royds Plumley Blissett, R.M. Merton Macfarlane Allen Dell supporting	Gales 7th, 8th, 11th, 12th.	17	To **Cape Crozier.** Record left —"*All well, Nov. 2.*" Found by Colbeck, Jan. 18, 1903. **Emperor's egg** found. Brought back many eggs. The three last men for a day to give a start.
Nov. 3–7	**Skelton** **Koettlitz**	Hare		4	To the **glacier snout**, and Razor-back Island in the bay, to look for rookeries. On **lower slope of Mount Erebus.**
Dec. 20 to Jan. 30	**Barne**	Smyth Plumley Dell Handsley Williamson Crean		40	To **depôt A,** two sledges, 1148 lbs. Went beyond A, exploring the coast to **79° 50′ S.** Turned back Jan. 14. **Back** at A Jan. 24.
Dec. 29 to Jan. 8	**Koettlitz** **Hodgson** **Ferrar**			11	To explore **Brown Island.** Ascended 2750 feet to its summit. Found a **volcanic cone and crater.**
Jan. 14–26	**Koettlitz** **Ferrar**			12	To examine and explore the **Bluff.**

POLAR JOURNEYS COMPARED.

Year.	Name.	Dist. in stat. m.	Days.	Remarks.
1853	McClintock	1328	105	1629 lbs. of fresh meat. *No dogs.*
,,	Mecham	1163	94	1460 lbs. of fresh meat. ,,
1854	Mecham	1336	70	1 reindeer, 3 hares, 30 ptarmigan. 20′ a day! *No dogs.*
1903	**Scott, Wilson, and Shackleton**	973	94	*Dogs* for first fortnight. Afterwards gradually became useless.
1853	Sherard Osborn	935	92	*No dogs.*
,,	Richards	840	86	,,
1851	McClintock	770	81	,,
1853	Vesey Hamilton	675	55	,,
1876	Aldrich	630	84	,,
1853	Nares	630	57	,,
1876	Markham	600	72	,,
1851	Ommanney	480	60	,,
,,	Sherard Osborn	534	58	,,
1903	**Armitage and Skelton**	600	52	Over difficult mountains and glaciers. *No dogs.*
1903	**Barne**	500	40	*No dogs.*
1854	Roche	590	39	*With dogs* entirely.
				,, ,, ,,

ON SOME NEW LAKES AND A LITTLE-KNOWN PART OF CENTRAL NEWFOUNDLAND.

By J. G. MILLAIS, F.Z.S.

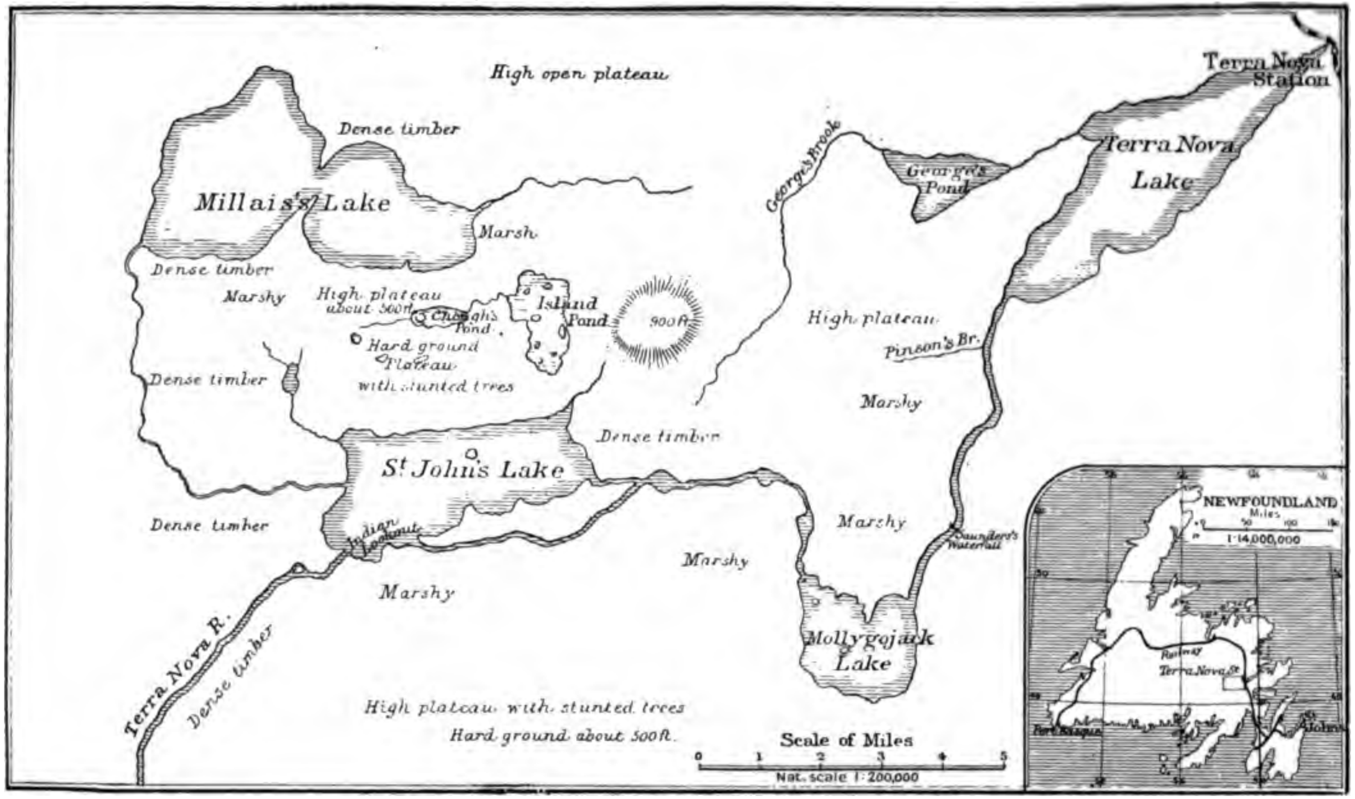
Sometime in the eighties the well-known geographer, Mr. Howley, undertook to map as much as possible of the centre and southern part of Newfoundland. For this purpose, he chose a route from the east at Alexander bay. All the coast-dwellers and men who had been a short distance into the interior after furs or caribou said he would certainly fail, owing to the difficulties of transport. However, thanks to the skilful guiding of an Indian and the efficient support of his men, Howley succeeded in getting right up the rocky Terra Nova river, past Mollygojack lake, and along the ground to the north of St. John's lake, where he seems to have roughly mapped the country by eye-sketching; eventually he turned south, and out to the southern coast through the dense country of the Kaegudeck and Meddonegonnix lakes. Howley mapped very accurately his actual line of route and the country within view, and succeeded in making an excellent journey where others would have failed. To this day, however, a very large portion of Central Newfoundland is less known than Central Africa, and much work remains to be done in the square enclosed on the north-west by the Annieopsquolch mountains, on the south-west by the La Poile river, on the south-east by the Meddonegonnix Lake river, and the north-east by the Gander river. The interior of the country, too, lying immediately north of the southern coast is also unknown, no hunting or other parties ever penetrating this region.

Some years after Howley's successful journey, another scientific expedition left the coast by the same route. The leader was a good man and a good geographer, but had little knowledge of Indians and their ways. He knew how to equip an expedition and how to map, but in this case, what was quite as important a matter, he did not possess tact, nor did he know that it was unwise to contradict a red man flatly, and differ on the subject of a country of which as yet he knew nothing. Arrived at St. John's lake, the leader turned to a man from the coast who likewise had never been so far before, and said, "Jim, how long is this lake?" "Fourteen miles, boss," replied the man. "Lake 5 miles long," broke in the Indian. "I'm sure it is double that distance," unwisely suggested the first white man, gazing into the hazy distance. The Indian gave a grunt, and half an hour afterwards the second expedition to St. John's lake was lamenting the loss of its guide. The whole party then immediately returned to the coast.

As each year drove the caribou from the coast, the men from Alexander bay kept following them further and further into the interior. It was considered impossible to work up the Terra Nova river, and few had ever ventured beyond Pinson's brook, where rapids

PART OF CENTRAL NEWFOUNDLAND

showing position of new lakes by J. G. Millais.



begin. The usual plan was to wait till the ice formed on the Terra lake, and then sledge up this and George's pond to the western end, and hunt the high country on the western plateaux. Every year, however, the caribou kept moving further west, till three years ago the men reached the furthest point which was known to them, namely, "Island pond," a beautiful sheet of water dotted with many wooded islands, and lying immediately to the north of St. John's lake. Here the hunters got all the caribou they wanted in a day, and retired to the coast again without penetrating further.

It was Mr. Frederick C. Selous, the well-known African traveller, who next (1900) trod these wilds after Howley's expedition. Practically in the middle of winter, he made a considerable tramp right across the high plateau beyond George's pond, and as far as the river that comes into St. John's lake at the north-western end. Here food gave out, and he and his packers had to retreat as fast as possible to their base camp on George's pond. With him went one Robert Saunders, an excellent guide, who expressed the opinion to Mr. Selous that it would be possible to ascend the Terra Nova river in the autumn, if proper canoes were taken, and hunt caribou at the western end of St. John's lake, where the deer were expected to be numerous. This Mr. Selous did the following autumn (1901), taking five days to ascend the rivers and lakes, and enjoyed such excellent sport on Lake St. John that it was for him unnecessary to travel further than his base camp, which I have named Indian Lookout.

Thanks to my friend Selous, I obtained his guides in the autumn of 1902, and followed the same route up the Terra Nova. I also made a base camp at Indian Lookout; but not finding caribou here, I crossed the lake to the north-west, and cut a road with the axe through the dense timber up to the high ground above, which I had previously seen with the telescope. There I made another camp, from which I searched all the unknown country to the north-east and north-west by making short expeditions of a night or two, and sleeping out in a reindeer bag.

It is, perhaps, necessary to go back for a little way and say a few words on the geographical features and general appearance of the country on the way up the Terra Nova river. After leaving the railway at Terra Nova station, the traveller passes up a river-lake system of about 4 miles before entering the large Terra Nova lake, which is some 8 miles long. On each side are dense forests sometimes several miles broad, and sometimes as narrow as a mile, this depending entirely on the elevation of the mountain plateaux, which generally rise gradually away from the river to an approximate elevation of 500 feet. Where the ground is flat it is boggy, and the timber exceedingly dense—so dense, in fact, that in most places a man cannot get through without the help of an axe. As the forests rise, however, they become more open, and higher still they are interspersed with little opens,

VIEW FROM NORTH-EAST ARM OF MILLAIS LAKE, LOOKING SOUTH-WEST.

locally called small "barrens." The most common trees are white and red pine, dogwood, hazel, rowan, birch, and white poplar, whilst along the river-edges are often dense masses of alder.

After leaving the western end of the Terra Nova lake, the traveller paddles easily up the main stream of the river for 5 or 6 miles until nightfall. During the next two days the current is too strong for boat work, and the river so full of rocks and rapids that you must travel along the stones and boulders by the water's edge whilst your men labour with the canoe, now pulling it through the streams and wading deep to keep the fragile craft from being smashed on the jagged rocks. It is cold and rough work for the men, but Newfoundlanders are used to hardships, and lie down at night without changing, "to steam the water out of them," they say. If you are lucky, you will reach the fine lake of Mollygojack on the third day, a grand sheet of water about 12 miles round, and dotted with a few islands, on which the great northern divers breed. Another day of hard toil for the men and rough walking for the traveller brings you to St. John's lake. This is always a difficult lake to traverse, as, lying almost due east and west, a slight breeze from the west renders it almost impossible to face without getting swamped. We were fortunate, however, on the ingoing journey, having a fine evening on which to paddle over the glassy surface. A female caribou stood gazing at us in the shallows, and flocks of dusky duck (*Anas obscurus*) and Canadian geese (*Anser canadensis*) drifted out of our way as we moved quickly up to the old-time battered tree of Indian Lookout. I thought this would be the end of our journey, but it was really only the beginning, for big stags showed no signs of coming. Consequently I resolved to go and meet them, and moved camp, as I have already described, to the high plateau on the north-west end of Lake St. John.

We are now in completely new ground, where Saunders, who is the pioneer of the hunting fraternity, asserted no white men had ever been in previous years. Everything bore promise of the numbers of caribou that frequent these woods by the abundance of deep time-worn trails in every direction, but the weather being simply perfect, and the temperature that of the south of France, the large stags showed no signs of moving out of their summer retreats, although the does had already commenced to travel. Consequently there was little to be done in the hunting line, so I tramped the country in every direction, taking bearings and making sketches for the small map here figured. Immediately to the north of the ridge above St. John's lake there is a long hollow sparsely covered with stunted larch and surrounded by woods on the west. Taking two bearings of 45° from each end of St. John's lake, and at an apex of 2 miles from the larger sheet of water, we came to a smaller lake about a mile long, which I have called Chough's pond. From this pond runs a little stream flowing due east for 2 miles, where it empties itself into the fine lake of Island pond. Island pond is about

5 miles in circumference. Though Howley must have passed close to the lake in his journey, it is not marked on his or any subsequent map. Except on its eastern margin, where the plateau rises somewhat abruptly to about 700 feet, the surrounding country is much broken and wooded, whilst the lake itself is dotted with numerous small islands covered with trees.

After spending some days to the eastward travelling and sketching, during which I shot two fine caribou stags, I next turned my attention to the north country. Passing directly north in the direction of the headwaters of the Gander, the traveller, after leaving the hollow with Chough's pond, rises gradually for several hundred feet, and finds himself in a wide open plateau composed of "dry ground," *i.e.* hard rock and stunted bushes. The general geological conditions are at once seen to be more northern from the presence of various lichens and arctic mosses, whilst the keen bracing air denotes a considerable altitude. It was from the northern edge of this high plateau that on September 10 we first caught sight of a new lake lying in a great basin surrounded by the usual well-nigh impenetrable forest. Saunders, my guide, at once said that this must be the lake he had once heard an Indian speak of as being a place where he had once speared many deer, but to which he could give no name nor indicate its position. The following day, after making a forced march, we determined to reach the lake and examine its eastern end, where there was a broad barren that joined two great forests. It took us three hours' hard work to make our way in the descent to the lake-shore. The distance from the open ridge to the water was only about 1½ mile, but such close forest I have nowhere encountered in other parts of the world where I have hunted.

Once arrived at the Sandy Beach, at the eastern end there is a glorious view of the surface of the new lake, which Mr. Reid kindly expressed a wish to name after myself. The whole lake is not so broad as St. John's, but it is considerably larger, and carries a greater volume of water. About 3 miles from the eastern limit, two long points of land project into the lake, and give the whole the appearance of an egg-glass. Forests entirely surround the lake, whose sides are for the most part steep, and devoid of beaches. The circumference must be estimated at about 20 miles. At the eastern end there flows in a good-sized stream (heavily stocked with the beautiful onananiche or land-locked salmon), which percolates from the east, rising on the high ground above George's pond, and flowing west down a broad valley about 2 miles to the north of Island pond.

A glance at any map of Central Newfoundland will show a fair-sized river falling into the western end of St. John's lake. It is marked as coming from due west, but in reality it does not come from this direction, but issues from the western end of Millais's lake to the north, where, after pursuing a southerly direction for some miles, it turns gradually to the east till it enters St. John's lake at the point indicated. During the following week I packed over and made a camp by the new lake, where I remained hunting and sketching for a fortnight. During this time I traversed all the vicinity through, not surmounting the high ridge to the north, which divides this country from the Triton brook, and which is also practically unknown.

THE EIGHTH INTERNATIONAL GEOGRAPHICAL CONGRESS.

The arrangements for the Eighth International Geographical Congress, which, as is known to readers of the *Journal*, will meet next year at Washington, are now taking shape under the care of a committee (presided over by Prof. W J McGee) representing the ten geographical societies and mountaineering clubs of the United States, which have united to welcome the geographers of all nations to American soil. According to a circular issued in June last, the Congress will meet in Washington on September 8, 1904, and will hold daily sessions on the 9th, 10th, 12th, 13th, and 14th of the month. Arrangements have been made provisionally for an excursion from Washington to St. Louis, *viâ* Baltimore, Philadelphia, New York, Niagara falls, and Chicago, between September 15 and 20, during which the Congress will be entertained by the Societies having their head-quarters at places on this route, the foreign members and associates being, it is expected, the guests of the ten societies collectively. At St. Louis, the members and associates of the Congress will take part in the International Congress of Arts and Sciences connected with the Louisiana Purchase Exposition, where a geographical exhibit is also planned. In case any considerable number of members so desire, a general excursion will be arranged from St. Louis *viâ* Laredo and the Mexican railway to the City of Mexico, thence *viâ* the Mexican Central and El Paso to Santa Fé, and so to the Grand Cañon of the Colorado and on to San Francisco and the Golden Gate, where the Western Geographical Societies will extend special hospitality; afterwards returning by way of Mount Shasta, Portland, and Mount Tacoma, and through the Northern Rocky mountains and the interior plains to the eastern ports. It is expected that special rates, from 25 to 40 per cent. below the ordinary, will be secured on this excursion.

The subjects for treatment and discussion during the meeting at Washington are classified under the following heads:—

1. Physical Geography, including Geomorphology, Meteorology, Hydrology, etc.
2. Mathematical Geography, including Geodesy and Geophysics.
3. Biogeography, including Botany and Zoology in their geographical aspects.
4. Anthropogeography, including Ethnology.
5. Descriptive Geography, including Explorations and Surveys.
6. Geographical Technology, including Cartography, Bibliography, Orthography of place-names, etc.
7. Commercial and Industrial Geography.
8. History of Geography.
9. Geographical Education.

The committee urge that early notice be given by those desirous of presenting communications or proposing subjects for discussion, July 1, 1904, being fixed as the latest date for submitting communications designed for printing in connection with the Congress, and August 1 in the case of abstracts (not exceeding 1000 words in length) designed for insertion in the daily bulletin.

Except in special cases, it is anticipated that not more than twenty minutes can be allotted for any communication, and in cases where no statement is made by the author as to the time required, only twelve minutes will be allotted. All papers presented, and subjects proposed for discussion, will be submitted for approval to a Scientific Committee, whose decisions shall, however, be subject to revision by the presidency after the Congress meets. Communications may be written in French, English, German, Italian, or Spanish.

The Committee of Arrangements extends a special invitation to geographical and cognate institutions to participate in the Congress through delegates, who will be expected to subscribe as members, though the publications of the Congress will be sent free to all societies represented. Membership (which entitles to the receipt of all publications) may be acquired by payment of $5, or £1; while ladies accompanying members may become associates on payment of half that sum, enjoying all the privileges of members except the rights of voting and of receiving publications. It is asked that those who intend to be present, or desire to receive the publications of the Congress, will send in their names at the earliest practicable date.

It will be seen from the above that every effort is being made to make the eighth meeting of the Congress as much a success from every point of view as its predecessors have been, and it is to be hoped that large numbers will avail themselves of the exceptional facilities offered, not only of enjoying intercourse with the geographers of the United States, but of gaining an insight into the broad geographical relations of the North American continent.

REVIEWS.

EUROPE.

BOTANICAL EXPEDITION TO CORSICA.

'Botanische Reisestudien auf einer Frühlingsfahrt durch Korsika.' Von Dr. M. Rikli.
Zürich: Fäsi & Beer. 1903.

In company with friends, Dr. Rikli, in the spring of 1900, made an excursion to Corsica to study the vegetation and other features of that island. The results obtained have been embodied in the small book above mentioned, which is illustrated by twenty-nine reproductions of photographs.

Corsica is an extremely rocky and mountainous island, the scenery as a whole being as often hopelessly monotonous as remarkably grand. The Spelunca near Evisa is an example of the latter. Geologically speaking, Corsica is in structure very similar to Sardinia, though some peculiarities have important effect on the appearance of the scenery. The rocks and mountains are generally brilliantly coloured, red predominating. These colours are due to red porphyry and granite, green serpentine, and many other minerals. Many of the rocks are corroded in a remarkable manner, on account, no doubt, of their not being of homogeneous structure.

The vegetation of Corsica is of great interest, as, owing to the restricted area under cultivation, much of the country is practically in a wild state. A few of the chief characteristics of the Corsican flora are recorded. Many of the species appear in large quantities and over large areas in almost pure formations, and not mixed with other species. The island has probably about two thousand different vascular plants—a very large number for such a small district. An explanation for this may possibly be found in two peculiar features noticed by the author. Many of the plants have a very short season; they soon disappear and make room for other species. Then, again, numerous local floras are found restricted to small areas, and dependent on some local peculiarity in the external conditions. The limestone flora of Bonifacio is an instance of this. The formations of the lowlands bear an essentially xerophil character, except along the watercourses. Higher up, however, in the hills hygrophil formations of beech forests are met with. Three regions may be distinguished when passing from the lowlands to the highest points on the island. The lowest region, which is mostly under cultivation, rises up to 900 metres. The vegetation is essentially of the Mediterranean sclerophyll type. The mountain region, 900 metres to 1800 metres, begins with the upper limit of the Spanish chestnut, and extends to the upper limit of the beech forests. The alpine region includes the remainder up to 2710 metres. Grassland with low-lying shrubs is found here. But this region is not covered by a continuous coat of vegetation, this being frequently interrupted through peculiarities in the formation of the substratum.

The different formations are discussed in detail, and many other points of geographical, geological, botanical, and even ethnographical interest are referred to. The photographs bring out clearly the general character of the scenery, and more especially of the vegetation.

O. V. DARBISHIRE.

ASIA.

ASIATIC RUSSIA.

'Asiatic Russia.' By George Frederick Wright. With maps and Illustrations. Two vols., pp. xxii., 637. London and New York. 1903.

This work, due to the enterprise of an American geologist, was originally planned as a study in physical geography, and took its present form as a result of the author's journey through China, Siberia, and West Central Asia. In this journey his special object was to study the conditions of the Asiatic "backbone" regions during the glacial period; but from physical research Dr. Wright was led on to examine the political and social facts—past and present—of the country visited; and thus the present volumes grew into shape. The keynote of these volumes is the connection of physical and human history in Asiatic Russia, and the need of studying both together. After the "Physical Geography," therefore (pp. 13–120), comes the "Russian Occupation" (pp. 123–340); next follow the "Political Divisions" (pp. 343–416), and the "Social, Economic, and Political Conditions" (pp. 419–481); and the work ends with a study of the "Natural History," the geology, climate, fauna, and flora (pp. 485–581). Under "Russian Occupation" we have a history of the Slav conquest of Siberia, Turkestan, and Caucasia, a very interesting inquiry into pre-Russian colonization, largely based (for Siberia) upon the collections of the museums at Minusinsk and Khabarovsk, and a detailed study of the immigration and settlement, both penal and free, of the Russians themselves. In this connection it may be regretted that a map in Lansdell's 'Central Asia,' showing the areas of Russian colonization, could not have been taken as a model for a fresh and up-to-date portrayal of the ethnological facts of Western Turkestan. Under "Political Divisions" we have a brief but decidedly useful "gazetteer of regions," affording a digest of all the more important facts of population, production, inter-communication, education, and physical environment. Under "Social Conditions" the author gives an excellent summary of the chief lines of road, rail, and river navigation, a carefully considered estimate of "capacity for development" under various heads—population, agriculture, irrigation, transport of goods, manufacture, and industry—and certain "grounds for confidence in the future" of Russian progress; while under "foreign relations" he touches cautiously but cheerfully upon the great political problems ahead of Russia in Asia. The whole area between the Yenisei, the Ural mountains, the ranges along the southern Turkestan border, and the dividing chains from the Pamir to Lake Baikal, is considered by Dr. Wright to have been the scene of a great subsidence in recent geological time. During this subsidence, as our author believes, the fertile soil, called "loess" in some regions, and "black earth" in others, was accumulated; the waters of the Arctic ocean covered all North-West Siberia and extended up to the base of the great Asiatic plateau; and when the ocean retired, it left the seals of the north behind it in the two isolated basins of Baikal and the Caspian. The sections of the present work on Russian colonization in relation to the Church and the Raskolniks, to the Village Commune, to the system of compulsory migration applied to "undesirables" by the village community, and to the system of free peasant emigration organized and controlled by the Central Government (for the more recent settlement of Siberia), are especially worthy of study; and not less so is Dr. Wright's analysis of the criminal statistics, showing that about 50 per cent. of all the Siberian exiles of the past consisted of persons banished by the village communities, forming 99 per cent. of those reported as banished by "administrative process," or by order from the Minister of the Interior. The author is conspicuously successful in his endeavour to present a picture of the actual contemporary development of Asiatic Russia. One well-established fact about existent railway, steamboat, industrial, or educational progress, he evidently considers, is worth reams of discussion of obsolete conditions. On this side of his work he has evidently drawn upon that invaluable work, the official 'Guide to the Siberian Railway;' just as in the historical chapters he owes not a little to Vladimir's 'Russia on the Pacific,' the best handbook yet published in the English language on the Slav conquest of North Asia.

In a treatise of such distinct merit it seems almost ungracious to notice defects. But it is unfortunately true that the reader is often harassed by the too frequent obscurity, carelessness, and ambiguity of the style, and that strange inaccuracies or inconsistencies are to be found here and there. Thus, Bering the "German," whose Danish nationality is elsewhere admitted (p. 147), Mithridates, the "great leader of the Parthian empire" (p. 271), the "celebrated Kara-Kitai . . . who had established *his* capital at Kulja" (p. 368), are puzzling; nor can we altogether grasp the "orthodox" Mohammedans of the Caucasus, as distinguished from Sunnites (p. 345). The author does not seem to be aware that the railway between Tashkent and Orenburg has for some time been in active construction (see p. 449), or that the Baikal-Kalgan railway project, over the Gobi, has been, for the time at least, abandoned in favour of the branch along the west slope of the Great Khingan range connecting the North Manchurian line with the Great Wall. Once more, he seems to write as if Timur's empire for years extended up to the walls of Constantinople and the banks of the Ganges (p. 371); he is rather loose in his references to eighteenth-century Russian history; and his spelling of names is occasionally inconsistent (*e.g.* Yana on p. 86, Jana on p. 87). But these and similar matters do not impair the general value of a most conscientious and useful study, marked in every part by an admirable candour and an open-minded spirit of inquiry.

C. RAYMOND BEAZLEY.

SIBERIA AND MANCHURIA.

'The Real Siberia, together with an Account of a Dash through Manchuria.' By John Foster Fraser. London: Cassell & Co. 1902.

This is a short, unpretentious, but first-hand record of a journey across the entire length of North Asia by the Siberian-Manchurian railway; it is also a record of the observations of an intelligent and practical man, who fairly claims for his book that, whatever its faults, it is the honest work of a man who went out to see, and has written about what he saw.

The result of Mr. Fraser's inquiries was to show that the popular, or rather the old, ideas about Siberia were altogether wrong. For here was a land of immense agricultural possibilities, great stretches of prairie waiting for the plough, huge forests, magnificent waterways, and rising towns—a country that recalled Canada and the best parts of Western America. The author has called his book 'The Real Siberia,' because in it he has tried to show that the Siberia of convicts and prisons is passing away, and the Siberia of the railway, the reaping-machine, the gold-drill, the new town, is awakening into life. He was one of the first Europeans—not a Russian—to cross Manchuria by the new railway, though he did not traverse the southern branch from Port Arthur to Kharbin, and the account of his transit is both interesting and valuable as a faithful account of the exact state of the "Chinese Eastern Railway" in the autumn of 1901. Occasionally Mr. Fraser makes mistakes or performs strange feats with Russian words—*cechas* (for *seichas*) on pp. 56, 57 may be mentioned, where the form represents neither the letters nor the sound—but as a whole 'The Real Siberia' may be emphatically commended. Its atmosphere is throughout one of reality and truth.

C. R. B.

'Durch die Mandschurei und Sibirien.' Reisen und Studien von Rudolf Zabel, mit 146 Abbildungen zumeist nach photographischen Aufnahmen des Verfassers. Leipzig: Georg Wigand. 1902.

This is one of the most thoughtful and valuable works we have had lately on East Asia—for with East Asia it is essentially concerned. The lands west of Baikal are only touched on in the last twenty pages (291–311, *Im "train de luxe"*), while all the remaining space is given to Pechili, Manchuria, the Maritime Province (Vladivostok, etc.), the Amur, and the Trans-Baikal region. The author first takes us from Pekin to Shan-hai-Kwan and the eastern end of the Great Wall, then through south-western Manchuria to Niuchwang, where he stops to describe how Manchuria became Russian, and what precisely was the state of Russian control and administration in the occupied provinces when he passed through (January to June, 1901). Dr. Zabel then visits the Russian leasehold in Southern Manchuria, describes Port Arthur and Dalnii in the Liao-tung peninsula, the future Gibraltar and San Francisco of East Asia, and discusses the treaty obligations undertaken by the Russian Government in respect to Manchuria (Part i., pp. 3–90).

In the second part of his book the writer details a wearisome stay at Vladivostok (*Leben und Treiben am Goldenen Horn*), and gives a fascinating sketch of a whaling voyage off the Siberian coast; next follows the journey by the Ussuri railway from Vladivostok to Khabarovsk; we are then given an historical sketch of Russia's advance from the Urals to the Pacific; and finally we are brought back to Europe, by steamer up the Amur between Khabarovsk and Stretensk, by rail through the Trans-Baikal to the Holy sea, over the Baikal in steamer once more, and home from Irkutsk by the Siberian express.

Two special features may be noticed in Dr. Zabel's work: first, the admirable series of illustrations, chosen with independence and judgment, often giving novel and striking pictures even of the best-known things and places, and always well finished; second, the philosophic and historical character of certain chapters and of many passages of other chapters. The original diary form is preserved throughout, and a very clear, animated, and amusing style is employed. Among the parts which seemed to add most conspicuously to older works we may instance—the account of Port Arthur and Dalnii, and of the measures taken to realize a great military and commercial future for the new Russian ice-free ports, in connection with which an instructive official plan of the projected town on Talienwan bay is given on p. 75; the description of the town, and especially of the Museum, of Khabarovsk, and its ethnological, biological, anthropological, and other collections; and the description of Vladivostok. On the other hand, the author has perhaps not given quite enough space and attention to Blagoveshchensk; and though one is grateful for the excellent letterpress on Port Arthur (pp. 64–72), its value would have been much enhanced by some views of the place. Economical and political reflections of no small value are to be found in almost every part of Dr. Zabel's book; in particular we may notice the concluding estimate of the Siberian railway on pp. 300–307. A select bibliography, useful, but omitting some of the most important recent studies of Siberia (*e.g.* those of Cotteau and Henry Norman), concludes the volume. C. R. B.

'The Great Siberian Railway.' By M. M. Shoemaker. New York and London, 1903 G. P. Putnam's Sons. Pp. viii., 236.

This is a record of a journey taken over the North Asiatic trunk line in the spring of 1902. It is a very condensed, note-book sort of a record, which everywhere shows an open and active intelligence, anxious to understand, to view things from an inside rather than an outside standpoint, but too careless, too much in a hurry, to produce a thoroughly satisfactory result. Distortions of names and inconsistencies of statement are constantly met with. Thus on p. 33 we have "Zalatouse" for Zlato-ust, the so-called "Golden-Mouth" town of the Urals. On p. 140 we are told that Mukden, in Manchuria, has 20,000 people; on p. 165 the same place is credited with 200,000. Two places are made into one in the strange compound Bitsy-vo-Tsin-chzou; elsewhere these two cities of the Liao-tung peninsula are distinguished (see pp. 126 and 136). The forms "Czar" and "Tsar," "Dalni" and "Dalney," "Chiliabinsk" and "Cheliabinsk" are used interchangeably, and almost with the freedom of an Early English book, where one never knows in what strange form an old friend will be next disguised. Again, while at Tomsk the author records, as the only historical event worth notice, the exile of Catherine Dolgoruky, he is silent as to Theodore Kuzmich, the monk, and says nothing of the local tradition that under this name lived and died the Emperor Alexander I. after his disappearance from the world at Taganrog. Lastly, both in praise and blame Mr. Shoemaker is hard to follow. On the one hand, we are told that Russia can accomplish more and in less time than any other nation (p. 59); on the other, no improvement is said to be discernible in the general information or intelligence of the people during the last twenty years. As usual, the truth lies between these extremes: Russia does not perform better and quicker work for civilization than other great nations; but it is idle to pretend that she does not accomplish a good deal. Her field of action is so vast that any progress at all among her people affects an immense area, both of space and race. Considering the backwardness of her development, she has of late advanced as rapidly as any country; and in education the percentage of "literates" has risen from 11 to over 25 per cent. in the last twenty years. But when all criticism has been made, it remains true that the general reader will find much in these pages to interest and inform him, especially in the copious extracts which the author gives from that primary source of reliable knowledge as to present-day Siberia, the 'Guide to the Great Siberian Railway,' published by the Ministry of Ways and Communications. C. R. B.

SAKHALIN.

'Un Bagne Russe' ('Ile de Sakaline'). By Paul Labbé. Paris: Hachette. 1903. Pp. 272.

This work consists of three parts—a study of the criminal transportation and colonization in the Russian Botany Bay of the Far East; an account of the mines and fisheries of the island, and especially of the latter as affecting Japanese interests and the diplomatic questions at issue between Russia and Japan; lastly, an elaborate description of the decaying native races of Sakhalin. In the first, M. Labbé, in sharp contrast to Mr. de Windt, criticizes and condemns with severity, though from his indictment it is apparent that certain important ameliorations have been gradually effected in recent years. In the second part an interesting parallel to the French shore question in Newfoundland is discussed, and the extreme importance to Japan of the Sakhalin fisheries is shown. "'Grace à la question des harengs, nous avons barre sur les Japonais' me disait un diplomate russe." At the same time it is contended that Russia will be only too glad to allow the Japanese to fish in Sakhalin waters, in return for a friendly neutrality as to Manchuria. In the third part, by far the most interesting and elaborate, the author makes a contribution of distinct value to our knowledge of the fast-dying aborigines of North Asia—Tunguses, Giliaks, Oroks, Ainus—and gives us a detailed account, from a long and close personal observation, of their manners and customs, occupations and modes of life, beliefs and superstitions, legends, songs, funeral and marriage ceremonies, and festivals. Especially is that festival depicted which centres round the sacrifice of the bear, that symbolic animal "stronger than a beast and wiser than a man" in whom Kirghiz, Mongols, and Tunguses alike recognize a supernatural power.

C. R. B.

AFRICA.

MOROCCO.

'Voyages au Maroc (1899–1901).' By the Marquis de Segonzac. Paris: Colin. 1903.

Of recent travellers in Morocco, none perhaps has done more to increase our knowledge of the country by itineraries through the little-known districts than the Marquis de Legonzac, a young and ardent explorer who, between 1899 and 1901, carried out a number of venturesome journeys in the guise of a Mohammedan sometimes passing for a mendicant, at others for the servant of an influential sheriff, and yet again as a pilgrim visiting the sacred places of the country. It will be readily understood that, journeying under these circumstances, it was no easy task to bring back a harvest of scientific results. Such, however, was M. de Segonzac's enthusiasm for his self-imposed task, that he triumphed over all obstacles, and the material which he secured in the form of route-surveys, astronomical observations, ethnological notes, botanical and geological collections, forms, as already stated, an important contribution to our exact knowledge of the interesting country on which so much attention is just now focussed.

M. de Segonzac's explorations had to do principally with three distinct regions, and we may glance at their principal results for each of these in turn. The first is the Rif—that home of turbulent tribesmen—into the interior of which hardly a European had previously penetrated, though its geographical features had been to some extent revealed by the painstaking study of native information undertaken some fifty years back by Captain Beaudoin, whose conclusions are in the main strikingly confirmed by his countryman's labours. M. de Segonzac twice crossed the whole breadth of the Rif country, first making his way from Fez to Melilla on the coast, and afterwards returning from the bay of Alhucemas to Fez by a route parallel to the former. His observations show that the Rif mountain massif consists of a series of ridges forming concentric arcs parallel to the coast-line between the Straits of Gibraltar and Cape Tres Forcas. The orographic core or centre of the region lies in about 34° 45′ N., between 3° 55′ and 4° 10′ W. of Greenwich. Among other results of these journeys is the means they supply of elucidating the travels of Roland Frejus in 1666, the only traveller who penetrated the Rif until recent years.

The second main division of the country on which new light has been thrown by M. de Segonzac is that of the so-called Middle Atlas, and of the upper Muluya valley to its south. Here his routes differed considerably from those of his predecessors—Rohlfs, De Breuille, De Foucauld, and others—and besides crossing the range twice, towards its eastern and western extremities, he penetrated to its main ridge from the north at about its centre, on the upper waters of the Sbu. South of the Mulaya valley he likewise attacked the chain of the Great Atlas, and effected the ascent of Jebel Aiashi, which he found to reach a height of 4250 metres, or almost 14,000 feet, the height which has generally been assigned to it. The Middle Atlas is described as formed by three chains which fall in terraces to the Sbu basin on the north. The principal chain is the southernmost, which falls some 9000 feet to the Muluya valley on the south, and culminates in the Jebel Mussa, 13,000 feet above sea-level. The third district traversed by the author lay at almost the opposite extremity of the kingdom, in the extreme south-west, where, though his routes were not to the same extent new, he did good work in giving greater precision to the map. His observations confirm satisfactorily the results of Joseph Thomson (as against the map of M. de la Martinière), as regards the position of the Bibawan pass over the Great Atlas, and its *rôle* in relation to the systems of the Tensift and Sus. Some new routes were also surveyed in the basin of the latter river, and in the Sahel region to the south.

Only the first two-thirds of the volume are occupied with the author's personal narrative, which embodies many interesting details on the country and its inhabitants, the remainder consisting of reports by specialists on the ethnological, meteorological, geological, and other scientific material brought home. Of 130 species of plants represented in M. de Segonzac's collection, twenty-seven are new to science as coming from Morocco, though found in other parts of the Mediterranean region. An excellent summary of the geographical results is supplied by M. de Flotte Roquevaire.

THE CONGO STATE.

New Africa. An Essay on Government Civilization in New Countries, and on the Foundation, Organization, and Administration of the Congo Free State.' By E. Descamps. Translated from the French. London: Sampson Low. 1903.

This book, whose author is Professor of International Law at the University of Louvain, is, in spite of its somewhat misleading title, virtually a presentment of the case for the Congo State in the controversy which is now engaging so much attention, and a favourable bias on the part of the writer is manifest at every page. Still, the book should certainly be read by all who wish to examine both sides before reaching a final conclusion on the subject. The services rendered by King Leopold and his coadjutors towards the opening up of a previously sealed region are put forward with much skill, while the reverse of the picture is as far as possible concealed, the abuses which it is allowed may exist here and there being treated as incidents not affecting the general issue. The writer criticizes the false views (as he takes them to be) prevalent respecting the international status of the state, showing—and with justice—that the Berlin Act was in no way responsible for its calling into being as an independent sovereignty. But like all the apologists, and not a few even of the critics, of the state's policy, he seems to overlook an important consideration, viz. that the claim of the state to nearly a million square miles of territory, including some of the most fertile and densely peopled regions of Africa, could never have been allowed by the European Powers, several of whom had prior interests in the region, except on the consideration of the philanthropic and international character of the enterprise; and that this fact places the state in an entirely special position among the ranks of sovereign powers.

As is but natural considering the standpoint of the writer, the part played by King Leopold in the modern awakening of Africa is greatly magnified. Many will, however, think that, if the merit belongs in reality to any one man, that man can be no other than David Livingstone.

THE NIGER.

'Le Niger: Voie ouverte à notre Empire Africain.' Par Capitaine Lenfant. Paris Hachette. 1903. Pp. vii., 252.

The primary object of Captain Lenfant's work, and of the record of that work which the present volume contains, is to show that the rapids of the lower Niger can be ascended or descended with sufficient ease and frequency for the purpose of maintaining constant communication by water between the upper river and the sea. In this enterprise the pioneers had been Lieut. Hourst and Captain Toutée, of whom the former had denied, and the latter had stoutly affirmed, the normal practicability of this fluvial route between Bussa and Say. Lenfant's experience fully confirmed the optimistic views of Toutée.

On February 21, 1901, a fleet of twenty boats under his command, plentifully stocked with supplies of all kinds, began the ascent of the Niger at its mouth, and on May 25 that same fleet, uninjured and with all its stores, arrived at Say; on May 29 it reached Niané, the Niger terminus of the direct route from Zinder and Lake Chad. On this voyage the two enclaves leased to France upon the lower Niger in the treaty of 1898—the "Enclave Toutée" in the Delta, on the Forcados channel, and the "Enclave d'Arenberg," just below the last rapids, and opposite Bajibo—were visited and used as bases of supply and reinforcement. Captain Lenfant makes an elaborate study of the hydrography of the Niger basin, the causes and extent of the annual floods, and the differences between the upper, middle, and lower river; for these three sections he uses the well-known terms of Joliba, Issa-ber, and Kwarra respectively. While naturally proud of his achievement, and an ardent exponent of this line of communication between the sea and the inner regions of the French empire in North-West Africa, the author does not conceal his conviction that the projected railway from the Dahome coast to Say (already completed as far as Abome) is the only satisfactory and final solution of the problem, the only adequate link between the middle Niger countries and the French African littoral. In the future of cotton-culture in the Western Sudan Captain Lenfant is a confident believer, and he devotes some of his most suggestive pages to an explanation of the best methods to be taken for ensuring the proper development of native industry. Miss Kingsley was fond of saying that the remarkable African dominion built up by the Third Republic had, along with many merits, one chief defect—a lack of commercial intelligence. But of late there have been many signs—and this book is one of them—that Frenchmen are awakening to the commercial possibilities of "France noire." C. R. B.

NIGERIA.

'Letters from Nigeria of the Honourable David Wynford Carnegie, 1899-1900.'
Privately printed. Brechin: Black & Johnstone. 1902.

The letters here printed were written to friends at home by the promising young Nigerian official, whose untimely death in the performance of his duty has been so deeply lamented by all who knew him and could duly appreciate his many fine qualities. They present a vivid picture of the everyday life of the European in the African wilds, and the fight against adverse circumstances which has to be waged by those who bear conscientiously (as did David Carnegie) "the white man's burden" in those fever-haunted regions. But apart from their pathetic personal interest, they contain many graphic touches, helping to a comprehension of the nature of the country, the life of its inhabitants, and their relation to the white man who dwells among them, which show that, had he been spared, their author would have been a trustworthy instructor of the public at home on West African affairs, no less than a capable actor amid the scenes described. His exceptional talent for dealing with native races, and his kindly feeling towards them, are constantly brought out, and the glimpses of his personal character which they supply enhance the regret at his sad and untimely fate.

AMERICA.

THE SIERRA NEVADA.

'Mountaineering in the Sierra Nevada.' By Clarence King. London: Unwin. 1903.

We welcome this reprint of a work which must always remain a classic in geographical literature, but which, owing to the fact that it has long been out of print and therefore comparatively inaccessible, is perhaps not so widely known to the present generation as it deserves to be. It possesses the twofold attraction of being written by a man of science, capable of drawing the proper lessons from the facts observed, who is at the same time keenly alive to the glories of external nature, and appeals to the imagination of his readers in his descriptions of the western forests and snowy mountains with a skill which has rarely been equalled; while the insight incidentally conveyed into his own personality is not the least of its charms. The book is well got up, and though it may be thought by some that its attractiveness would have been enhanced by illustrations of the striking natural scenery first explored by Mr. King and his companions, it is no doubt more satisfactory on the whole that the book should remain as it left its author's hands. It is, we repeat, one which should find a place in every geographical library, no matter of how modest extent.

MATHEMATICAL AND PHYSICAL GEOGRAPHY.

EVOLUTION OF BOTANICAL GEOGRAPHY.

'Botanische Forschungen des Alexanderzuges.' Von Dr. Hugo Bretzl. Leipzig: Teubner. 1903.

During his daring expedition for the conquest of India, Alexander the Great was accompanied by a staff of officers who not only looked after military operations, but who in part were told off to make observations of scientific interest when visiting places which were new to the Greeks, and India, of course, was to the Greeks a quite new world. The records of these scientific observations made by the members of Alexander's military staff during their stay in India and their return journey were deposited in the imperial archives of Babylon. These were unfortunately destroyed later on, but not before they had been made use of extensively by Theophrastus when writing his 'Stories of the Plants.' Alexander the Great was the first to collect scientifically material for a treatise on the distribution of plants; Theophrastus was the first to write a memoir on this subject.

In the book now under review, Dr. Bretzl has succeeded in giving the reader a very good idea of what the Greeks observed and noticed on their expedition to India. By quoting freely from the Greek text of Theophrastus, and by frequent reference to modern books, he has been able to establish the marvellous accuracy of the observations made by Alexander's officers, and the scientific value of the memoir which Theophrastus based on those observations. Though essentially botanical, the book before us should appeal equally in the first place to the geographer, the botanist, and the classical student, but in the second place to anybody who can appreciate the first dawning of an important branch of natural science—namely, the geographical distribution of plants. Dr. Bretzl's book contains many chapters which are hardly of sufficient general interest to be referred to here, but one or two are worthy of more detailed notice. These will serve to show the character of the whole book.

The mangrove forests, which the Greeks first saw from their ships, have been most carefully described by Theophrastus by the aid of the material supplied by the Greek officers; and from the Greek text of his work, Dr. Bretzl is able to make out the chief components of the mangrove forest in the Persian gulf—the large trees of *Avicennia officinalis* with their greyish leaves form the dense inner part, *Rhizophora mucronata* with its green leaves the marginal portion of the forest. This observation is new to botanists, as far as the Persian gulf is concerned, but is circumstantially confirmed by researches into the mangrove of the Red sea. *Rhizophora mucronata* has been so well described by the Greeks as to make it possible to determine exactly the months during which the Greeks visited the mangrove swamps. They saw the flowers in November, and the mature fruit in December and January, but they did not observe the peculiar viviparous germination of the seed. This interesting phenomenon was first recorded by the Arabs.

Theophrastus comes to the conclusion that the brackish water favours the growth of the larger *Avicennia*, whereas the smaller *Rhizophora* prefers the pure salt water of the sea. This view is also held by Dr. G. Karsten, and it shows that Theophrastus was already hunting after a physiological reason for the geographical distribution of plants.

Schimper does not record the occurrence of mangrove forest along the shores of the Persian gulf, nor does he admit that west of the mouth of the Indus any other plant but *Avicennia* is found as the chief constituent of the mangrove forests. On reference to Theophrastus, we find that the Greeks carefully noted the presence of the mangrove forest in the Persian gulf. From their descriptions, furthermore, it is clear that *Rhizophora mucronata*, in addition to *Avicennia*, formed part of the swamp vegetation; thus we are able to glean new facts from observations made two thousand years ago. This distribution of the Mangrove in the Persian gulf, as mentioned by Theophrastus, receives ample confirmation on reference to the excellent British Admiralty charts. The mangrove forests observed along Clarence strait and along the north-eastern coast of Bahrein island were carefully examined by Alexander's officers. These old observations are compared by Dr. Bretzl with modern researches, and in the end the reader gets a very clear idea of these remarkable marine forests, and their distribution and history.

The history of the banyan tree, *Ficus bengalensis*, is well recorded by Theophrastus; he even discusses the morphological nature of the props as root-structures. But he has come to grief over the description of the leaves, which evidently belong to *Musa sapientium*, and not to *Ficus bengalensis*.

The Greeks not only made careful observations when away from home, but they also studied their own flora. It was due chiefly to this that they were able to notice and appreciate the many remarkable plants they came across on their journeys. Thus very early they separated geographically the sunny and dry continent of Asia (including Africa) from the moist and cold Europe. Theophrastus was able to confirm this view from his own observations. *Abies pectinata*, a fir, he found to be an exclusively European tree, not occurring in Asia, except along the coast of Asia Minor, which, however, he considered to have the same climate as Greece and the other parts of Europe.

The date-palm was correctly taken as the typical plant of the sub-tropical desert zone of Asia, the fir and ivy as two types characteristic of the Central European forest zone. This view was held by the Greeks till they came to the Himalayan hills. The four typical coniferous trees of the Himalayan forest mentioned by Schimper are also noticed by the Greeks, namely, *Abies Webbiana* and *Smithiana*, *Cedrus deodora*, and *Pinus excelsa*. The latter occurs also in Macedonia. The Greeks ascended the hills of the Himalayan range more than 2100 metres in search of wood for building ships, by which to return to Greece. The vegetation noticed between 900 metres and 2100 metres struck the Greeks as being remarkably similar to the vegetation of the lowlying plains of their native country. Both regions are characterized by sclerophytes (plants with hard leaves). Beyond the 2100 metres they got the forest; they were thus able to observe the regional division of the vegetation on the mountain-side, the higher regions of a tropical mountain being generally temperate in character. The Greeks were very much surprised to find coniferous trees so far away from home, and this discovery should have put an end to their theory that the conifers were exclusively European plants.

The Greeks returned home from India partly by sea and partly by land. The overland route led them through Baluchistan, where they fully appreciated the ever-dry sandhills and the generally dry wadis, which are, however, occasionally flooded during a heavy downpour of rain. The land journey also showed them that there was no connection between the needle-leaved forests of the Himalaya and Macedonia. For this reason—not perhaps very logically—they continued to uphold their view that the fir was essentially a European tree. Theophrastus had already come across one exception, namely, a forest in Armenia, which has since been admirably described by Radde. Theophrastus has made mistakes here and there, but in separating *his* Europe from *his* Asia, he was practically preparing the way for the separation of what we to-day call the Central European forest region.

Eratosthenes was the first to see that Europe and Asia could not be separated by a north-to-south line on geobotanical evidence. A line should be drawn from east to west to separate a northern from a southern district. This view, which makes the fir woods of Macedonia and the Himalaya not widely separate groups, but merely southerly outrunners of the large northern forest, has received ample confirmation from modern geobotanical research.

The attempt has been made to give, in a few words, some idea of the scope of Dr. Bretzl's book, which is a most valuable and interesting publication. It should make fascinating reading for all those who take an interest in geography in its widest sense.

O. V. Darbishire.

GENERAL.

MOUNTAINEERING.

'Hochtouren in den Alpen, Spanien, Nordafrika, Kalifornien und Mexiko.' Von Raimund Schäfer. Leipzig: J. J. Weber. 1903.

Dr. Schäfer is an ardent climber and a geologist as well as a doctor of medicine. His volume is very various in its contents. In the early chapters he recounts his alpine adventures, which include a night in the observatory on the summit of Mont Blanc. These are followed by some tourist's notes on Spain, and a glimpse at Morocco. The reader is then called on to leap the Atlantic, cross by the Canadian Pacific Railway to San Francisco, and return by Mexico. To the geographer the most interesting portion of the volume will be the account of the great Mexican volcanoes. Dr. Schäfer climbed Popocatepetl, Orizaba, and Ixtaccihuatl, and gives interesting details as to their features and geology. He calls attention to the unequal melting of the snowfields under tropical skies which produce the conditions known in the Andes as "Nieves penitentes," a term the origin of which Dr. Schäfer misapprehends. Sir M. Conway's observations* do not seem to have been taken account of in the explanation he offers of the phenomenon. The volume is well got up, and fully illustrated; some of the coloured plates from the author's sketches being exceptionally successful.

THE MONTHLY RECORD.

THE SOCIETY.

French Geographers at the R.G.S.—An excursion to this country having been arranged in connection with the Annual Congress of French Geographical Societies, held this year at Rouen, an invitation was sent by the Society to the members of the party to a luncheon to be held in their honour during the course of the visit. It was at once accepted, and Monday, August 10, fixed for the date of the reception. On that day a party of some ninety members of the Congress, including several ladies, arrived at the Society's house at 11.30 a.m., and was received, in the absence in Norway of the President, by Major Darwin and other members of the Society's Council and staff. Among the distinguished visitors were M. Zévort, rector of the Caen Academy and president of the Congress; M. Canonville Delys, president of the *Société Normande de Géographie;* Generals Guillet and Messonier; M. de Saint Arroman, representing the Ministry of Public Instruction; M. Monbrun, representing the Geographical Society of Oran and the Government of Algeria; M. Monflier, general secretary of the Congress; and M. Sarrazin, the historian of Normandy. After examining the various objects of interest at the Society's house, including manuscript maps by explorers, early editions of Ptolemy, and other old geographical works which had been laid out for their inspection, the visitors proceeded at 12.30 to lunch at Limmer's Hotel, where the chair was taken by Major

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* 'Aconcagua and Tierra del Fuego,' pp. 55 *et seqq.* Reference may also be made to Dr. Hauthal's paper in the *Revista del Museo de la Plata,* vol. x. (1902).

Darwin, who expressed regret at the inevitable absence of the President. The other representatives of the Council included Lord Belhaven and Stenton, Mr. E. L. S. Cocks, Colonel J. K. Trotter, Colonel C. M. Watson, Captain D. Wilson-Barker, and Mr. D. G. Hogarth. The chairman, in proposing in French the toast of "His Majesty King Edward VII.," alluded to the services recently rendered by the King as a messenger of good-will between the two nations; and the toast was drunk with great enthusiasm, as was also the second toast, that of "M. Loubet, the President of the French Republic." In proposing the toast of the French Geographical Societies, in terms which again elicited a warm demonstration of good-will on the part of the company, Major Darwin spoke of the good work done throughout the world, largely under the inspiration of the oldest French society, that of Paris, by French travellers, mentioning in particular the names of Dumont d'Urville, who was exploring the southern polar seas at the time of the English expedition under Sir James Ross; Lieut. Bellot, who lost his life as a volunteer on one of the Franklin search expeditions; and the Gold Medallists of the Society, MM. Garnier, Reclus, Binger, and Foureau. In replying to the toast, M. Zévort expressed the thanks of the members of the Congress for their cordial reception by the Royal Geographical Society, alluding to the enhanced pleasure derived from the fact that they had been received by a son of Charles Darwin. MM. Vial and Canonville Delys having also spoken, M. Monbrun (of Oran) proposed a toast to the closer union of the British, French, and African geographical societies, remarking that the society which he represented was the oldest representative of the last category. In conclusion, M. Sarrazin made a courteous allusion to the services rendered to the Congress by the British delegates, Mr. H. J. Mackinder and Mr. J. P. Thomson.

EUROPE.

Basins of Subterranean Drainage in the Swiss Alps.—Messrs. Lugeon, Ricklin, and Perriraz have presented a note to the French Académie des Sciences (*Comptes Rendus*, cxxxvi., No. 18, May 4, 1903), on the areas drained by rivers which disappear underground as measured on the 1 : 25,000 or 1 : 50,000 Siegfried sheets. The following is a summary of the results:—

	Depressions.	Hectares.	Acres.
Pre-Alps, left bank of Rhône	8	1,088·3	2,689·2
Marginal zone of Pre-Alps (between Rhône and Aar)	2	24·6	60·8
Middle zone of Pre-Alps (between Rhône and Aar)	46	4,123·0	10,188·6
Internal	16	727·7	1,798·3
High Alps, limestone, Savoy to Aar	28	11,067·8	27,350·1
.. .. Aar to Reuss	21	3,439·1	8,498·5
.. .. Reuss to Rhine	65	17,189·4	42,477·4
Alps of Valais, south of Rhône	11	358·5	885·9
,, Ticino	8	642·7	1,588·2
.. Grisons, south of Rhine	31	3,516·6	8,690·0
Total	236	42,177·7	104 227·4

The majority of these closed basins are in the limestone, which is Upper Jurassic in the Pre-Alps, Urgonian in the outer, and Malm in the inner regions of the High Alps. They are rare and unevenly distributed in the crystalline Alps, mainly where limestone occurs, while they are uncommon on the Flysch and absent in the folded molasse. The majority are near lines of faulting, and it is remarkable that high parts, such as the Wildhorn, Wildstrubel, and Zilbern, loose their melted snow by sinkholes, and so may be compared to pierced roofs. Few are found near the great valleys. Most possess little lakes of variable level, *e.g.* Lake Tancy, Daubensee, Glattensee, Obersee of the Glarner Alps.

Weather and Bird-migrations in Hungary.—The influence of weather conditions on the arrival in Hungary, in spring, of migratory species of birds, has been studied for some years by J. Hegyfoky, who summarizes the results of his observations in the *Meteorologische Zeitschrift* for February of this year. With regard to the arrival of swallows, he has found that the mean date of arrival is April 5, the isotherm for which day is 9°·4 C. (53° Fahr.), which agrees well with the facts observed with regard to the temperature of the mean date of arrival at eighteen different stations in Europe. A retardation of 3·03 days was observed for 100 metres' increase of altitude, while only 1·17 days' retardation seems occasioned by 1° difference in latitude. For a proper comparison of the arrival of birds with the weather conditions, it is not sufficient to know the mean date of arrival, and Herr Hegefoky therefore attempted a comparison of the whole course of the phenomenon with the corresponding weather conditions. He found that in six different years the period of five days in which the arrival of swallows culminated was one of low barometric pressure. This fact was most clearly marked in 1898 and 1899, in which years the greatest number of observations were taken, it being found that during a period of low pressure which prevailed from March 25 to April 2, 1898, 51·5 per cent. of the total arrivals were recorded, and during a similar period in 1899, from April 8 to April 16, 44·2 per cent. Much was found to depend on the direction from which the depression advanced, for its influence was so much the greater when its favourable side was turned towards Hungary, and mild weather with south, south-west, or south-east winds prevailed. These conclusions were also borne out by observations of the arrival of the cuckoo and other species. Dividing the country into four main subdivisions—the great plain, the western region, with a small amount of lowland, the eastern mountains, and the northern mountains—the writer finds that the birds arrive first at stations in the first-named, an average retardation of 5·1 days being observed for the western region, 6·1 days for the eastern, and 10·5 for the northern. These facts are again explained by the climatic conditions. Other observations show that the species which arrive early show a larger amount of variation in the date of arrival than those which arrive later, and this is of course due to the greater variations in the weather conditions in the earlier period.

New Triangulation in Iceland.—The old triangulation of the coast of Iceland, executed by Major Scheel in 1801–15, has been found to be very defective, and in 1900 Captain Hammer reported that it was impossible to base a marine survey on the old triangulation between Reykjavik and the Hornafjord. It appears from the old map that the surveyors, owing to the difficulties of the country, were not always able to complete the network, as between Ingolfshöfdhi and Klifatindr, about 60 miles distant, which they had to connect by a polygon, and that some angles at the stations could not be measured. Calculations of the line Stadhfjall—Ingolfshöfdhi from the net eastwards from Akranesskagen and by the southern series, resulted in a difference of about 70 yards. Accordingly, in the summer of 1902, an expedition was sent from Denmark to execute a new triangulation along the southern coast, which was divided into two parties, one under Captain Lund-Larssen proceeding to Hornafjord, and the other working eastwards from Reykjavik. The former measured a base 5501·178 yards long on a landspit at the mouth of Hornafjord, from which they carried a network of triangles westwards, establishing stations on the steep lofty summits of Thverártindsegg and Bakkatindra, and including the islands Hrollangseyjar and Tvisker in the survey. Being favoured by calm, bright weather, they were able to land and take observations on the Hrollangseyjar. This network was extended westwards to Kaldbakur and Fossnûpr, and the Reykjavik party, which had fewer difficulties to contend with, pushed its triangulation to Seljaland, east of Markarfljót. The work was satisfactorily carried out, and the results will no doubt be at least accurate enough for all practical purposes—*Geografisk Tidskrift*, 17de Bind, Hefte i.–ii.

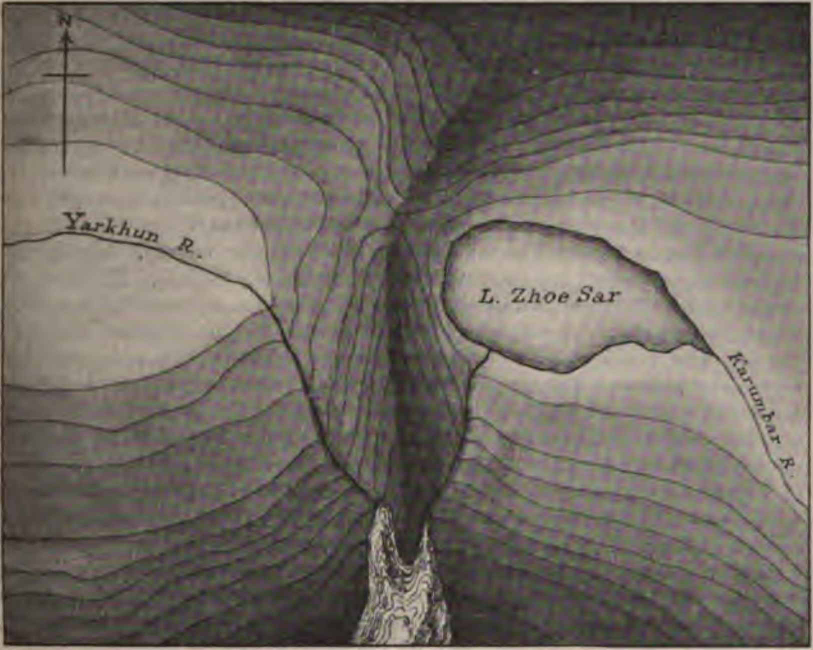
ASIA.

The Restoration of the Ancient Irrigation Works on the Tigris.—Since his retirement from the superintendence of the Egyptian reservoirs, Sir William Willcocks has been surveying the remains of the old irrigation works in the Tigris-Euphrates basin, in order to ascertain how far it might be possible to repeat in the Mesopotamian lands the engineering operations which have been attended with such signal success in the Nile valley. He has embodied his views on the subject in a paper read before the Khedivial Geographical Society, Cairo, on March 25 of the present year, and since printed as a pamphlet. His studies on the spot were greatly facilitated by the previous surveys of Commander Felix Jones, to whom all due acknowledgments are made, and whose two large maps of the Nahrwán canal and of the Tigris north of Baghdad (1849–50) are here reproduced, together with ten plates of illustrations. The now roughly completed surveys of the remains of reservoirs, dams, bridges, and regulators between Dura and Babylon show that there were formerly three distinct irrigation systems—one on the left, another on the right bank of the Tigris, and a third connecting that river with the Euphrates on the plains of Shinar. Near Opis (later Antiochia) at the head of its inland delta, the Tigris is joined by the Atheim (Physcus), on the left, and lower down by the Dyala (Delas), just above Baghdad. Here were developed the two systems of the Tigris proper, that of the Nahrwán canal on the left, and the Dijeil on the right bank. The Nahrwán, the largest canal ever constructed out of China, had its original head at Dura, about midway between Nineveh and Babylon, where the intake is still marked by the massive ruins of Kantereh-Kesareh. From this point it was carried southwards for 240 miles along the left bank of the main stream, feeding all the secondary canals drawn from the Atheim and the Dyala, and supplying abundance of water to many hundred thousand acres of rich alluvial lands. In the section between the 100th and 120th mile, where Nausherwan's ruined palace forms a striking landmark, its banks are studded with ruined cities, and in some places this vast artificial artery was from 40 to 50 feet deep and over 300 feet wide. Its sudden ruin, caused by some unexplained diversion of the upper waters, brought about that utter desolation from which the middle Tigris region has never recovered. The second (Dijeil) system, though smaller, was still very extensive, and jointly with the first must have sufficed to irrigate nearly 2,000,000 acres of extremely fertile but now waste lands. When to these are added about 1,500,000 acres of the third (Tigris-Euphrates) system, we get a total of 2,800,000 acres which might be profitably reclaimed and cultivated, without including perhaps 3,000,000 acres lower down (about the Shatt-el-Arab), which have become too saline to be worth reclaiming at present. "Summing up the figures for upper Chaldea, or the lands of the [inland] delta of the Tigris, and for the swamped lands of lower Chaldea between Babylon and Baghdad, we have a total area of 2,800,000 acres, and expenditure of £21,000,000 (for canalization, earthworks, and weirs), and a return of £60,000,000. These figures may seem large, but we are in one of the most famous tracts of the world, a tract whose past history justifies us in expecting that great results will follow if we bring to the solution of our problems the same wisdom the wise men of Chaldea brought to the problems of their day" (p. 25). The whole question is studied, not only on its merits from the purely agricultural standpoint, but also in connection with the proposed extension of the German Anatolian railway to the Persian gulf, and on this question Sir William has some shrewd remarks. "The Baghdad railway—that is what I have called the Mesopotamian section—will traverse these regions; its rails will be laid on the banks of a renewed and remodelled Nahrwán canal, and life and prosperity will again be seen in this land of great vicissitudes. Shall the canal be made with British capital coming from the west? Speaking financially, shall the canal be known as the Katul-il-Kaiser-i-Hind, or Katul-il-Kaiser-il-Almaigna; or, as of old, Katul-il-Kesrawia [the "Trench of the Kaisers"]? Labourers from India—British subjects—will dig the canals, construct the weirs and regulators, and then settle down in millions to reclaim and cultivate these lands potent with future wealth just as though they were in another Panjab. The through traffic between Europe and the East will be yielding no inconsiderable income, but when this traffic is supplemented by the transport of the abundant harvests of Chaldea, the Baghdad railway will be establishing itself as a financial success capable of satisfying the most sanguine of its promoters" (p. 32).

The Ancient Bed of the Oxus.—Prof. Bartold has made an interesting discovery relating to this vexed question, the details of which were fully discussed by Prince Kropotkin in vol. xii. of the *Journal*, p. 306. Hitherto no reliable notice has been found of the navigation of the lower course of the Amu-daria at the time when it flowed into the Caspian sea. Now, in the autumn of 1392 Timur conquered Mazanderan and sent its Seiid rulers to Kharezm (Khiva). According to Zakhir-ed-din-al-Merash, a historian of Taberistan who lived at the end of the fifteenth century, they were taken by boat from Sari to Ogurcha (an island off the east shore of the Caspian), and thence in boats up the Jihun (Amu). Here the author regards the disemboguement of the Amu into the Caspian as a well-known fact. Prof. Bartold holds that Abulfeda and other writers simply reproduced the statements of geographers of the tenth century and of Yakut, while Kazvin (fourteenth century) and Khafizi-Abru (early in fifteenth century) give independent testimony. The former states that several branches of the Jihun enter the lake of Kharezm, but that the main arm, passing through Kharezm, precipitates itself from the heights of Khulm, which in Turkish is called Yördeli (noise), for the roar can be heard to a distance of 2 or 3 *farsakh,* after which it falls into the Khazar (Caspian) sea at a place called Khalijan. From Kharezm to the sea it is six days' journey. Formerly flowing into the lake of Kharezm, it changed its course about the time the Mongols appeared in the country. Khafizi-Abru makes the same statement, saying that now—that is, in the year 820 (1417 of our era)—the Jihun had made itself an outlet to the Caspian, crossing the road from Khorasan to Bokhara. The Khojent (Sir-darya), he says, reaches Farab (a place on the Amu opposite Charjui), and, continuing on its course, unites with the Jihun in the Kharezm steppe. In an anonymous history written in 1582, in Turkish, for the sultan Murad III., it is said that God, being angry with the people of Kharezm, turned aside the Jihun from their capital, Urgench, and that it then flowed at some days' journey from the city.—*Zemlevedeniye,* 1902.

The Water-parting between the Chitral and Gilgit Rivers.—Major G.

Leslie, R.E., who has lately visited the sources of the Kunar or Chitral river, has finally solved the mystery of the Karumbar lake, which has hitherto been supposed to be the source of the Yarkhun (the main affluent of the Chitral river) flowing west, and of the Karumbar (an affluent of the Gilgit river) flowing east therefrom. As was proved in the case of the Oxus sources, the lake is not, strictly speaking, a source at all, but merely an incident in the course of the Karumbar stream flowing east, which has its real or ultimate source in a glacier which sits astride of the ridge dividing the Karumbar and Yarkhun valleys. Just as the glaciers and snow-fields astride of the Nicolas range supply all the main sources of the Oxus in the Pamirs by means of radiating and diverging streams, so does this glacier send down one tributary to the lake on the course of the Karumbar (the lake is locally known as Zhoe Sar), and another to the Yarkhun. The glacier, and not the lake, is thus the common origin or source of both streams. The accompanying map is based on a rough sketch sent home by Major Leslie.



SOURCES OF THE YARKHUN AND KARUMBAR RIVERS.

AFRICA.

Egypt Fifty Years hence.—This is the title of an address delivered by Sir W. Willcocks to the Khedivial Geographical Society in March, 1902, which is printed as an appendix to the above-noticed paper (see p. 327) on the restoration of the Mesopotamian irrigation works. It deserved, perhaps, greater consideration at the author's hands, for, although of a somewhat speculative character, this flight into the future has a basis of solid fact, and in any case has a special value as the forecast of such a skilled observer. Taking his stand, so to say, on the barrage just constructed at Assuan on his own plans, Sir William looks up and down the great artery, and sees visions of ever-growing prosperity, not only in Egypt, the land immediately benefited by that great work, but also in the whole region from the equatorial lakes to the Mediterranean. What, he asks, will the Nile valley look like fifty years hence? And he answers, "Green it will surely be; but it will be no longer a beacon pointing to the permanent prosperity which the irrigation systems of the ancient world could confer on a country. It will be a beacon showing what modern irrigation and modern science can do to develop agricultural wealth." Works will be carried out far beyond those of the Pharaohs of the twelfth dynasty, works which, in all human probability, will raise Egypt to a height of splendour and magnificence never witnessed even by the Ramses and Thotmes of the Middle Empire. A chief factor in developing the natural resources of the land to its utmost capacity will be the gradual transformation now going on of the old basin irrigation to a perennial system, to be effected by repeating the operations at Assuan on a greatly enlarged scale at all advantageous points in the direction of Khartum and the great lakes. Here will be constructed the vast reservoirs by which the upper Nile waters are to be husbanded and brought completely under control, and here will be settled the millions of industrious *fellahin* who "will have streamed southward into the peninsulas of Meroe and Sennaar, to begin there a new Egypt which may one day rival the old." Another element of prosperity will be the Suez Canal, a most valuable asset which reverts to the Egyptian Government in a few decades. Then, fifty years hence there will be communication by steam along the whole length of the Nile valley. By steamboat and by railway it will be possible to proceed from Alexandria and Port Said to Mombasa. The products of the Sudan will be finding an efficient outlet by means of the Khartum-Berber-Suakin railway. It may even be possible, by railway and by steamboat, to proceed to the Cape. In this latter case a colossal statue of Mr. Cecil Rhodes will greet the railway traveller as he passes the equator, just as Lesseps' statue greets him on entering the Suez Canal. The White Nile itself will undergo great changes, when the sudd and other obstructions are permanently removed, and its waters, now partly lost in the terrible swamps about the Sobat confluence, will flow over mighty weirs and dams, and down well-regulated channels. "From Lado to Khartum will be one unbroken stream, about 500 metres in width, of pure and wholesome water, with long rows of willows by the water's side on either bank. The sudd regions and the sudd marshes even, in great part, will have ceased to exist, and in their place will be the beginning of millions of acres of rice-fields and water-nuts." There is to be a huge regulating weir at Ripon falls, where the Nile leaves the Victoria Nyanza, and here, as well as at the Nile cataracts, will also spring up electric stations and factories for grinding plantain meal, one of the most nutritious and digestible foods in the world. At Tobongo, south of Wadelai, will be the great regulating weir, like those of Assiut and the Delta, but very much larger. "The amount of water held up will be 4 metres, and the width of the weir will be some 400 metres. It will be possible to discharge 2500 cubic metres per second at any time of the year. This quantity of water will suffice for the irrigation of 8,000,000 acres of cotton or sugar-cane in the valley of the Nile." It is to be hoped that no untoward complications may arise to disappoint the author's sanguine forecast.

The British East Africa Protectorate.—Sir Charles Eliot's recent report on the East Africa Protectorate (Africa, No. 6, 1903) is most interesting reading, and once more affords abundant evidence that in the Protectorate we have a possession which well deserves the attention of all interested in the development of the British Empire. The record of progress during the past year is, on the whole, thoroughly satisfactory, both as regards the material improvements introduced and the tendency displayed by the native inhabitants to accept the control of the white man and live peaceably under his administration. The policy recommended by the High Commissioner of avoiding for the present a forward policy in the outlying provinces, and concentrating effort on those already more or less brought under control, seems thoroughly wise, for it is evident that the latter districts will supply work for the most energetic administration for some time to come. In the northern parts of the protectorate (Jubaland, etc.) the Somalis form a disturbing element, and without greatly improved communications the permanent settlement of Europeans among them, which would no doubt gradually change their attitude, is quite impracticable. In the Tanaland province the fertile districts of the Lamu and lower Tana regions are of considerable importance, though here too the fear of Somali raids has to be reckoned with. In the chief coast centres, the commissioner reports a great improvement as having taken place since he first knew them. At Mombasa the streets have been drained, enlarged, and beautified, new roads made, a hotel and bank opened, while a cathedral is in contemplation, and a Hindu temple and Mohammedan temple are nearly completed. Improvements have also been made at Lamu, Malindi, Takaungu, and Kipini, and a pier has been built at Mtanganyiko, a grain-exporting centre at the head of the beautiful Kilifi creek. In the interior a great advance has been made at Nairobi, where excellent roads have been made in all directions, and a fair number of shops opened, while there is a decent hotel and one cab. The flatness of the site (chosen originally merely as a railway centre) is a disadvantage from a sanitary point of view, but the adjoining swamp has been drained and turned into market gardens, while it is intended in future to build principally on the healthy surrounding hills. Sir Charles Eliot fully supports Sir H. Johnston's views as to the suitability of a large part of the interior plateaus for European settlement, which gives to the East Africa Protectorate (now embracing the whole country up to the Victoria lake) its special importance among recent additions to the British Empire. As a field for colonization it is compared with Australia and New Zealand, while it is said to be superior to South Africa, though similar in many ways. Ten years' experience has now shown that European children born in the country can live and thrive there. Among the more favoured districts, in addition to Kikuyu, Kenya, Nandi, Guas Ngishu, etc., the commissioner refers specially to Njoro, occupying the first low slopes of the Mau escarpment, and to the country lying behind Naivasha and east of the rift-valley, which has hitherto been little known, but which a recent visit enables him to pronounce one of the finest districts in the Protectorate. The railway, though not passing through the richest districts, affords a series of points from which they are easily accessible. Wherever Government stations have been established, the natives in the neighbourhood have become peaceable and friendly, the chief difficulties arising from the actions of unscrupulous traders in outlying districts, and from the propensity of the natives to attack caravans of Swahilis and Indians. In spite of rumours regarding the existence of gold-bearing reefs, the future of the country lies in its great agricultural resources, derived both from its indigenous products and its striking capacity for growing those of other countries. It is satisfactory to know that the protection of the valuable forests has been secured by the appointment of a Conservator of Forests. In conclusion, after pointing out that East Africa is the greatest philanthropic achievement of the later nineteenth century, Sir Charles Eliot expresses the opinion that, with proper measures, the country is certain to pay its way in ten years, probably in a much shorter period.

Dr. Hartmann's Explorations in South-West Africa.—Dr. George Hartmann, who last year gave an account of his explorations in the region of the lower Kunene and Ovampo-land, before the Berlin Geographical Society (see the *Zeit-*

schrift of that body, No. 3, 1902) has since given a somewhat fuller narrative in the *Beiträge zur Kolonialpolitik*, published by the German Colonial Society (1902–3, part 13). The journeys were made in 1900 and 1901, one of the main objects being to study the question of a possible railway route from the Otavi copper-mines to the coast. But apart from their results in this direction, they have thrown much new light on the physical features of the country, which, especially in the so-called "Kaoko-Feld" to the south of the Kunene, has hitherto been very imperfectly known. This region was explored in 1900, great difficulties being experienced from the nature of the country. The chief characteristic is the terrace-formation, which is prolonged beyond the Kunene into Portuguese territory. The coast-plain, or first terrace, is bounded to the east by a line of hills and sand-dunes, beyond which lies the higher "Namib" plain, while this again leads to an exceedingly broken mountainous zone, consisting in great part of table mountains, which are the outliers of the great interior plateau which lies still further east. A vast number of watercourses run down between these mountains, and though dry for a great part of the year, the underground water is sufficient to support a considerable vegetation; and as in the south their beds can be traced to the sea, they there form bridges, as it were, by which the otherwise waterless plain can be crossed with ease. In the north they all disappear in the line of sand-dunes, and the coast region is here particularly inhospitable and difficult to travel through. It was found that the various watercourses (one of which was discovered for the first time) had been placed too far north on the existing maps, and that their direction had also been shown inaccurately. In the mountain valleys the vegetation is luxuriant, becoming more and more tropical towards the north. Palms reach far to the south of the Kunene, and in the northern section vegetation extends westward to the line of dunes, among which grass is often found. The dunes vary greatly in extent, reaching their maximum in the neighbourhood of the Kunene and Hoanib. Although quite possible routes for a railway were found, the conditions on the coast proved very unfavourable for a landing-place, and it was therefore proposed to carry the line in a north-west direction across the Kunene to a port in Portuguese territory, which would have the advantage of being nearer Europe, while the line would in this case be of greater value as part of a transverse system of communication across South Africa. To study the possibilities of such a line was the object of Dr. Hartmann's journey through Ovampo or Ambo-land in 1901. The passage through this rich park-like country was effected without difficulties with the natives, and the Kunene reached at Otjipempadiva. Dr. Hartmann then explored the region below the first cataract of the Kunene, and found it to be an excessively wild mountainous tract abounding in big game, and covered with an almost impenetrable thorny scrub. He, however, discovered a good crossing-place for a railway below the second cataract, and an easy route thence to Port Alexander, while he also visited the third cataract, an imposing fall of over 300 feet, hitherto undescribed. He thinks that in time of flood it can hardly be inferior in grandeur to Niagara or the Victoria falls. Dr. Hartmann, who is sanguine as to general possibilities of the German territory, considers that the "Kaoko-Feld" possesses many advantages for a European settlement, one being the present scarcity of population. The thickly peopled Amboland, split up between a number of independent tribes, will present more difficulties to the extension of German control, but a judicious policy will, Dr. Hartmann thinks, lead to the desired result without the employment of force.

Captain Lenfant's New Expedition.—With the joint support of the Paris Geographical Society, the French Colonial Office, the Comité de l'Afrique Française, and the Académie des Inscriptions et Belles Lettres, Captain Lenfant has started on a new and important expedition to the Niger basin. Entering by the Forcados mouth, on which one of the French *enclaves* is situated, he proposes to ascend the Niger and Benue and make his way to Lake Chad by the Tuburi marsh and the Logone, studying the hydrographical connection between the basins of the Benue and Shari, and its possible utilization as a navigable waterway from the Atlantic to the Central Sudan. Captain Lenfant, who has secured the cooperation of MM. Delevoye and Lahure, will execute a careful survey, and may possibly make his way home by way of the Nile.

AMERICA.

History and Influence of the Wabash Trade Route.—An instructive study, which brings out clearly the influence exerted by a natural line of communication on the economic development of a region, has been undertaken by Mr. E. J. Benton, of the Johns Hopkins University, and published as one of the "Studies" issued by that body (Series xxi. Nos. 1 and 2). The importance of the Wabash route as a means of communication dates back to the days of the early French adventurers, who pushed towards the Mississippi from the great Canadian lakes for the purposes of the fur trade, although other more westerly routes, notably that from Lake Michigan to the Illinois, had come earlier into use, only to yield in time before the natural advantages possessed by the more direct route from Lake Erie to the Wabash and Ohio. The first use of the latter seems certainly due to La Salle, though it was only after the founding of Fort Pontchartrain by Cadillac, on the site of the modern Detroit (1701), and the gradual extension of the French posts towards the lower Wabash (1719–1727), that its pre-eminence was fully established. For many years after this the French and English struggled for the strategic points along the Wabash line, but under the eventual English occupation, and still more after the severance of political connection with the St. Lawrence valley, its significance as a highway declined, to be revived, however, in the nineteenth century, when the increasing tide of westward emigration rendered the improvement of communications between the east and west of the United States an imperative necessity. In the second section of his work Mr. Benton traces the progress of the agitation, which, after many delays, led to the construction of the Wabash and Erie canal by the States of Indiana and Ohio; while in the third, which is of special interest to geographers, he considers the influence which this route has had on the development of the "Old North-West," as the region first touched by the westward movement from the Atlantic States is sometimes called. He points out that it does not suffice, for an understanding of the history of this region, to trace the inflow of the immigrants through the great Appalachian gateways, but the further distributing forces must also be taken into account. The Wabash route formed one of the natural highways which invited the settler to push onward, and was of especial influence before the construction of railroads had lessened the influence of physical barriers. By reference to statistics and other records, Mr. Benton shows forcibly the effect which the opening of the canal had in enhancing the value of real estate, rapidly increasing the population, and promoting agriculture and commerce in the region which it served; not only making possible the increase in population by giving access to markets for the disposal of produce, but actually supplying that increase by the immigration that passed along it. Its influence is to be traced in the fortunes of many still flourishing towns, which owed their first impetus to it, as well as of others which with it have now lost their importance. Mr. Benton concludes by pointing out that the influence of the Wabash route does not end with the fall of the canal, but is continued by the Wabash railroad, its economic successor.

Meteorology of Jamaica.—In the recently published Colonial Office report on Jamaica, some space is devoted to the meteorology of the island. With regard to the rainfall, the May and October rains are strongly marked throughout the island, but in the north-eastern and northern divisions, which roughly embrace the whole of the north of the island, there are in addition winter rains in December, January, and February, while elsewhere there are, as a rule, summer rains in July and August. In the majority of places there is never a month without some rain, but at times in the drier months there are isolated localities where none falls. Kingston, the capital, is one of the driest places, and Port Antonio, on the other side of the Blue mountains, though only 30 miles distant, is one of the wettest. In the north-eastern division the effect of the vapour-laden trade winds impinging upon high mountain ranges is well shown, and here the total fall in some part exceeds 200 inches. The west central region comes next in elevation, coolness, and rainfall. The northern is largely an elevated and undulating table-land of limestone ridges and valleys; the southern contains the chief plains in the island. These two last-named divisions are comparatively dry. The average rainfall for the last three decades, 1870–79, 1880–89, 1890–99, is given as 67·4, 66·5, and 76·1 respectively, but last year's record (1901–2) exceeded this considerably, averaging 80·9 inches. The mean temperature is shown to be 78·8 Fahr., varying from 75·7 in February to 81·6 in July. The report announces the severance of the connection of Mr. Maxwell Hall, the Government Meteorologist, with what remains of the Weather Service Department, which he established in 1880. For some three years past economy has necessitated retrenchments, and it is now decided that the compilation of the weather report shall in future be undertaken by the Chemist's Department.

The Furos de Breves, Amazon River.—In 1900 Dr. J. Huber explored the network of *furos*, or channels, which connect the Amazons and the Pará estuary, extending from the F. Tajapuró eastwards to the Rio Amará. The islands which so thickly stud the Pará estuary are either of old formation, and consist of sandy and clayey deposits with beds of the characteristic sandstone of Pará, or are of recent alluvial formation. To the second class belong all the islands enclosed by the Furos de Breves, and they occupy, in Dr. Huber's opinion, an area which was formerly a broad channel connecting the Amazons with the Pará. There is no foundation for the view that the furos have been cut through continuous land. The tide ascending the Pará meets the descending water of the Amazons in the furos at points known to the local inhabitants as *encontros d'aguas* (meetings of waters). The silt-laden water of the Amazons, which still finds its way out through the Pará in considerable quantity during the ebb, is thus dammed up at high tide, and the stagnation allows the silt to settle down. The process of island formation may be still witnessed. A bank is formed, which at length rises above the water, and is gradually covered with vegetation, the first forms to appear being *Montrichardia arborescens* and *Drepanocarpus lamatus*, the seeds of which can swim for some time on water, and these are soon joined by mangroves. As the islands increase in size the channels between them become more restricted, and the land at length assumes the appearance of having been intersected by furos. These have a breadth varying from 50 to 500 yards, and a depth of 30 to 180 feet. Their affluents are the *igarapés*, which originate in marshy tracts of forest called *igapós*. Most of the land is inundated in the rainy season, and a fresh deposit of silt is laid down on it. A similar region of furos occurs in the north-west of the island Marajo. The channels there are also subject to fluctuations caused by the tide, but they belong entirely to the hydrography of the Amazons, and have now no connection with the Pará. The streams coming from the centre of the island were no doubt formerly branches of the Amazon delta, for the *igapós* and lakes in which they rise communicate with rivers flowing in the opposite direction. West of the Tajapurú the contrary movement has taken place, and the furos are cut off from the Amazons and communicate only with the Pará. Dr. Huber describes fully the vegetation of the furo region.—*Boletim do Museu Paraense*, vol. iii. Nos. 3 and 4.

The Lower Orinoco.—Observations made during a voyage on the lower Orinoco in October last by the German warship *Panther*, and summarized in the *Annalen der Hydrographie* (1903, part 4), supplement and correct in many ways the information given on existing charts. On entering by the Boca Grande, the bar, the position of which is shown by no mark on the coast, could not at first be found, and the smallest depth revealed by sounding was 5·6 metres (18 feet). The Indian pilot, who had been taken on board at Port of Spain, followed in the main the course laid down on the American chart: but as the course adopted varies at different times of year and according to the direction of the voyage, no definite line can be laid down. The *Panther* anchored each night, and soundings and observations of the rate of current were then taken; but as the anchorages were often sheltered by projecting points, the latter do not represent the rate of current in mid-stream. Thus the observed rate off Ciudad Bolivar was only 2 nautical miles, while in the centre it is placed at 4 miles and over. The depths at the anchorages varied from 13·5 to 27 metres (45 to 90 feet). Although the state of the river has little influence on the depth on the bar, the difference between high and low water amounted to 7 metres (23 feet) and more at Cuidad Bolivar. From January to March no depths greater than 10 feet can be depended on, and ships drawing as much water as the *Panther* cannot navigate the river after December. The primæval forests which clothe the banks of the Boca Grande and extend with little intermission to Barrancas, give place higher up to tall bush with many clearings. Above Barrancas the principal places are Guiana Vieja (with two forts placed on a spur of the southern mountain chain), and Las Tablas, the latter being of some importance as the starting-point of a road to the mining region in the south. A number of points are enumerated in which the existing charts of the river are inaccurate.

Vegetation of the Galapagos Islands.—The Galapagos islands have, since Darwin's visit on the *Beagle*, been explored by numerous travellers. The botanical results obtained by the latter have been compiled and published in a condensed form by Mr. B. L. Robinson in the *Proceedings of the American Academy of Arts and Science* (vol. 38, No. 4, Oct. 1902, pp. 77–270, 3 plates). A list of the species so far observed on the islands is given, and their geographical distribution on the separate islands, as far as they have been explored. This is followed by an account of the general features of the flora. Generally speaking, the vegetation of the islands up to 300 metres is extremely xerophil; beyond that the climate is moister, the plants being consequently more hygrophil, and it is here that a few trees, never very high, are found. Of the 590 vascular plants found on the islands 40·5 per cent. are endemic. The affinities of the flora are discussed at some length, as evidence regarding the origin of the whole group of islands. The islands are generally held to be of independent volcanic origin, and to have emerged from the ocean without ever having been in connection with the American continent; the species met with owing their origin to seeds which chance has brought on to the islands. Another theory, elaborately worked out by Dr. Baur, supposes the Galapagos islands to have been separated from the American continent by an extensive subsidence. The botanical evidence, according to the author, "is opposed rather than favourable to the subsidence theory." The remarkable difference between the florulæ of the various islands themselves and the American continent is adduced as an argument against such a theory. At the same time, Baur has advanced biological arguments in favour of his hypothesis, which still remain unanswered. The whole paper is a very valuable contribution to geobotany in general, and our knowledge of the Galapagos islands in particular.

POLAR REGIONS.

Antarctic Relief Expedition.—The urgent need of sending once more a relief expedition in support of the *Discovery* having been recognized by the British Government, it has been decided to despatch such an expedition this year under the orders of the Admiralty. The *Morning*, which since her return from her first voyage has been lying at Lyttelton, New Zealand, in readiness for a second advance south at the end of the present year, has therefore been made over to the Admiralty authorities, while a second ship, the *Terra Nova*, has been acquired in Newfoundland, and will accompany the *Morning* as an additional precaution against possible mishap. She has been brought to Dundee, where the work of refitting and taking on board the necessary stores has been proceeded with energetically, with a view to the ship starting for New Zealand about the end of August. In this work the authorities have had the assistance of Captain Colbeck, who arrived in England towards the end of July, and who will again have the command of the expedition, the captain of the *Terra Nova* being Captain Harry Mackay, whaling master, who has had considerable experience of Arctic navigation, both as master of the *Terra Nova* when the vessel belonged to the Dundee whaling fleet, and when in command of the yachts *Eskimo* and *Blencathra* (owned by Mr. Barclay Walker and Mr. Coates respectively) during their cruises in the Arctic seas. Her crew will be entirely a mercantile one, composed chiefly of whalers of experience. In order to save time, as the season is somewhat far advanced, the *Terra Nova* will proceed to New Zealand *viâ* the Suez canal, being escorted through the Mediterranean by the cruiser *Minerva*. In case it should be found impossible to extricate the *Discovery* in time to return early next year, the officers, scientific staff, and crew of the latter vessel will be taken on board one or other of the relief ships. It is to be confidently expected, however, that the measures to be taken by Captain Scott during the coming Antarctic summer will result in the setting free of the vessel, as the time available for the operations will be so much greater than was the case last season, when the time taken by the sledge expeditions, and the full expectation that the vessel would be set free by the annual break-up of the ice, naturally delayed the commencement of the work until the summer was already far advanced.

MATHEMATICAL AND PHYSICAL GEOGRAPHY.

River Curves and Entrance of Tributaries.—Prof. Davis, in the April number of the *Geological Magazine*, agrees with Dr. Callaway that tributaries enter meandering streams on the convex sides of the curves (cf. *Geographical Journal*, February, 1903, p. 193). He disagrees, however, with Dr. Callaway's explanation, and points out (1) that rivers are not initially quite straight; (2) that the initial bends tend to develop into meanders; (3) that the meander system tends to move down the valley; (4) that this explains the entrance of tributary streams at the convex sides of meanders, any stream which originally did not do so being ultimately captured by the approaching meander; (5) that cut-offs occur here and there; (6) that these cut-offs are not straight, and tend to develop into meanders (cf. edition of preliminary maps of Mississippi River Commission, St. Louis, 1900–1901); (7 and 8) exceptions to (4) are where a tributary follows the old bed to a cut-off, or enters a river flowing through relatively narrow meandering valley (lower Wye, Seine, Moselle, or north branch of Susquehanna).

The Development of River Terraces.—In an elaborate paper on "River Terraces in New England" (*Bull. Museum Comp. Zoöl.*, Harvard, xxxviii.), Prof. W. M. Davis discusses the evolution of terraces in valleys which have been filled with glacial drift through which the river is still cutting its way. The conclusions to which he comes are—"First, a diminution of stream volume may have taken place during the terracing of our New England valleys, but it has not been essential to the production of the observed terraces. Second, the terracing rivers have slowly degraded their aggraded valleys while actively swinging from side to side; degradation probably being the result of the combined action of a slow northern uplift and a gradual decrease of load, and in spite of a probable decrease of volume. Third, the chance discovery of rock ledges by the swinging river is the chief cause of the systematic diminution of interscarp spaces and of the preservation of terraces, as seen in a typical section of stepping terraces." He then develops a theory of river terraces in which he traces the successive terrace forms shaped by a free-swinging, slowly degrading river, and then the constraints imposed by "the accidental encounter with previously buried ledges at various points in its course and at various stages in its history." This he illustrates by a series of ingeniously devised "solid" diagrams, showing the various patterns of terraces which can be formed by such processes of river-action as are involved in the theory; and finally these are compared with the actual terraces in New England. As in most of Prof. Davis's papers, an attempt is made to employ a systematic terminology. Among the more general expressions used are *meander belt*, for the space enclosed between tangents drawn outside the curves or meanders of a stream; *sweeping*, for the progressive movement of meanders down a valley; *swinging*, for the lateral movement of the meander belt from one side of the valley floor to the other; *wandering*, for the compound movement of sweeping and swinging: and *belt of wandering* for the whole breadth of the valley floor that may be worn down by the stream, which corresponds to the flood plain, which is in New England locally termed an "interval." Cut-offs, ox-bow lakes, and cusps are now well-known terms of American authors. Prof. Davis in this paper uses the term *short-cuts* for channels formed during floods, which straighten the river but are not necessarily cut-offs, and *lobes* for the land bounded on all but one side by a bend of the river on the plain

The Employment of Means in Meteorology.—Those who make use of the results of meteorological research without being themselves experts in that science must frequently have experienced a doubt as to the justification for the general use of mean values of meteorological elements as representing the normal or most probable values for such elements. The same doubt has forced itself upon the mind of the well-known French meteorologist, Prof. Angot, who points out in the *Comptes Rendus* of the Paris Academy of Sciences (May 18, 1903), that such use of means could only be considered legitimate if it were shown that the natural causes which bring about a variation from the mean act in precisely the same way as the purely fortuitous causes which operate generally in cases of variation. In order to test the actual existence of this condition, he has examined the records of temperature for France for the fifty years 1851-1900, obtaining the mean for each month, and the actual deviations from the mean, and thus deducing the probable error in any particular case. He has then found the number of observations (out of the total of 600) in which the actual deviation from the mean has equalled or exceeded various multiples of the calculated probable error, and compared the results with those deduced theoretically in the case of purely fortuitous causes of variation. The agreement is surprisingly complete, and Prof. Angot concludes that for France, at least, the arithmetical mean of the temperatures observed for any given month for a series of years is at the same time the most probable value of such temperature, and the one which will occur most frequently. The employment of means is therefore justified for France and for the particular meteorological element in question, but Prof. Angot notes that in the case of rainfall the significance of the mean is more than open to doubt. This seems borne out by the recent calculation of the mean rainfall of London for a series of years, given in 'British Rainfall' for 1902, which shows that the results on the basis of 90 years' observations are decidedly different from those on one of 60. Prof. Angot also notes that his period of fifty years is not sufficiently long to give the absolute mean with any great exactness. Would it not, however, be the case that, granted the possibility of long-period variations of climatic elements, the mean obtained from observations within a less number of years would give more nearly the probable value of any element within the same period than one based on a longer series?

GENERAL.

Commercial Geography at Manchester.—Mr. John McFarlane, M.A. (Edinburgh and Cantab.), has been appointed Lecturer in Political and Commercial Geography in the Owens College, Manchester. Mr. McFarlane has hitherto devoted his attention to history and economics, but we understand that he will spend a term at the School of Geography at Oxford before entering on his duties at Manchester.

CORRESPONDENCE.

Stone Figures in China.

Northbrook House, Bishops Waltham, Hants, August 11, 1903.

As regards "Stone Figures in China," p. 210 of the August *Geographical Journal*, Mr. Bourne's "Notes of a journey to the Imperial Mausolea East of Pekin" (*Proc. R.G.S.* (1883), vol. v. p. 23) show that stone figures of men and animals in parallel rows line the approaches to some of the tombs of the present Manchu dynasty; the explanation given by a Chinese, and accepted by Mr. Bourne, being "the stone figures are to a dead emperor what the pageantry and display of a court are to the living one." The Manchus may have adopted this custom from the Chinese, and, if so, the explanation given to Dr. Sewell McFarlane that the stone figures he saw were at the entrance to the tomb of a prime minister is probably correct. Mr. Bourne refers to a paper in the *Journal* of the Shanghai Branch of the Royal Asiatic Society for 1878, by Mr. W. F. Myers, "On the Stone Figures at Chinese Tombs, and Offerings of Living Sacrifice," which may throw more light on the subject.

H. W. TRINDER.

GEOGRAPHICAL LITERATURE OF THE MONTH.

Additions to the Library.

By EDWARD HEAWOOD, M.A., *Librarian*, R.G.S.

The following abbreviations of nouns and the adjectives derived from them are employed to indicate the source of articles from other publications. Geographical names are in each case written in full:—

A. = Academy, Academie, Akademie.
Abh. = Abhandlungen.
Ann. = Annals, Annales, Annalen.
B. = Bulletin, Bollettino, Boletim.
Com. = Commerce.
C. Rd. = Comptes Rendus.
Erdk. = Erdkunde.
G. = Geography, Geographie, Geografia.
Ges. = Gesellschaft.
I. = Institute, Institution.
Iz. = Izvestiya.
J. = Journal.
k. u. k. = kaiserlich und königlich.
M. = Mitteilungen.
Mag. = Magazine.
Mem. = Memoirs, Mémoires.
Met. = Meteorological.
P. = Proceedings.
R. = Royal.
Rev. = Review, Revue.
S. = Society, Société, Selskab.
Sitzb. = Sitzungsbericht.
T. = Transactions.
V. = Verein.
Verh. = Verhandlungen.
W. = Wissenschaft, and compounds.
Z. = Zeitschrift.
Zap. = Zapiski.

On account of the ambiguity of the words *octavo*, *quarto*, etc., the size of books in the list below is denoted by the length and breadth of the cover in inches to the nearest half-inch. The size of the *Journal* is 10 × 6½.

A selection of the works in this list will be noticed elsewhere in the "Journal."

EUROPE.

Alps. **Baedeker.**
The Eastern Alps, including the Bavarian Highlands, Tyrol, Salzburg, Upper and Lower Austria, Styria, Carinthia, and Carniola. Handbook for Travellers by Karl Baedeker. Tenth Edition, revised and augmented. Leipzic: K. Baedeker, 1903. Size 6½ × 4, pp. xxvi. and 572. *Maps, Plans, and Panoramas. Price* 10 *m. Presented by the Editor.*

Austria—Levelling. *M.K.K. Militär-G.I.* **22** (1902): 110–120. ———
Die Fortsetzung des Präcisions-Nivellements, ausgeführt im Jahre 1902.

Balkan Peninsula. *Sitzb. K.A.W. Wien* **110** (Ab. I.) (1901): 437–478. **Cvijić.**
Die dinarisch-albanesische Scharung. Von Prof. J. Cvijić. *With Map.*

Balkan Peninsula. *Sitzb. K.A.W. Wien* **110** (Ab. I.) (1901): 409–432. **Cvijić.**
Die tektonischen Vorgänge in der Rhodopemasse. Von Prof. J. Cvijić. *With Map and Profiles.*

Balkan Peninsula. **Haardt.**
M.K.K. Militär-G.I. **21** (1901): 136–300; **22** (1902): 155–489.
Die Kartographie der Balkan-Halbinsel im xix. Jahrhunderte. Von V. Haardt von Hartenthurm.

Bulgaria—Census. *Deutsch. Rundschau G.* **25** (1903): 467–469. ———
Zur letzten Volkszählungsstatistik des Fürstentums Bulgariens.

Europe—Ethnology. *Globus* **83** (1903): 333–335. **Wilser.**
Das Verbreitungszentrum der nord-europäischen Rasse. Von Dr. L. Wilser.

Europe—Political. *Deutsch. Rundschau G.* **25** (1903): 396–403. **Mucha.**
Geographische Sonderbarkeiten. Von J. Mucha.
On small, more or less independent sovereignties and communities in Europe.

Faroe Islands. **Villiers.**
Trade and Laws of the Faroe Islands, Foreign Office, Annual No. 2984. Size 10 × 6, pp. 48. *Price* 2½*d.*

France—Calvados. *C. Rd.* **136** (1903): 1345–1347. **Bigot.**
Sur la géologie du pays de Cinglais (Calvados). Note de A. Bigot.

France—Coasts. *B.G. Hist. et Descriptive* (1902): 349–402. **Pawlowski.**
Les transformations du littoral français, Les pays d'Arvert et de Vaux d'après la géologie, la cartographie et l'histoire. Par A. Pawlowski. *With Maps.*

France—Corsica. *C. Rd.* **136** (1903): 1705–1707. **Castelnau.**
Observations sur des phénomènes de glaciation en Corse. Note de P. Castelnau.

France—Geology. **Barré.**
Commt. O. Barré. L'Architecture du Sol de la France. Essai de Géographie Tectonique. Paris: A. Colin. 1903. Size 10 × 6½, pp. iii. and 394. *Diagrams. Price* 12 *fr. Presented by the Publishers.* [To be reviewed.]

France—Navigation. *Contemporary Rev.* 83 (1903): 797–819. **Baudin.**
The Internal Navigation of France. By Pierre Baudin. *With Map.*

France—Nord. *B. Union G. Nord de la France* 24 (1902): 193–233. ——
Industrie Lainière de la Région de Fourmies.

France—Picardy. *Ann. G.* 12 (1903): 109–119. **Hitier.**
Le village picard. Par H. Hitier. *With Plates.*

France—Pyrenees. *Ann. Club Alpin Français* 28 (1901): 213–241. **Saint-Saud.**
Étude Orographique sur le Bassin Lacustre Occidental du Néouvielle (Hautes-Pyrénées). Par M. de Saint-Saud. *With Map and Illustrations.*

France—Vosges. **Delebecque.**
Contribution a l'étude du système glaciaire des Vosges Françaises. Par A. Delebecque. Paris: C. Béranger, 1901. Size 10 × 6½, pp. 16. *Map. Presented by the Author.*

Germany—Berlin. **Baedeker.**
Berlin and its Environs. Handbook for Travellers. By Karl Baedeker. Leipsic: Karl Baedeker; London: Dulau & Co. 1903. Size 6½ × 4, pp. x. and 238. *Maps and Plans. Price* 3m. *Two copies. Presented by the Editor and Messrs. Dulau & Co.*

Germany—Frankfurt on Main. ——
Beiträge zur Statistik der Stadt Frankfurt am Main. Neue Folge. Fünftes Heft: Die Schülerzählung vom 30. November, 1900. Franfurt-a.-M., 1903. Size 11 × 7½, pp. 38 and cxii. *Diagram.*

Germany—Lakes. *Globus* 83 (1903): 286–287. **Halbfass.**
Zwei Seen in der Moränenlandschaft des Bodensees. (Schleinsee und Degersee.) Von W. Halbfass. *With Map.*

Germany—Saxony. **Ruge.**
Dresden und die Sachsische Schweiz. Von Prof. Dr. Sophus Ruge. (Lande und Leute. Monographien zur Erdkunde . . . herausgegeben von A. Scobel, xvi.) Bielefeld und Leipzig: Velhagen and Klasing, 1903. Size 10½ × 7, pp. 176. *Illustrations. Price* 4s.

Iceland. *G. Tidskrift* 17 (1903-1904): 26-41. **Thoroddsen.**
Geografiske og geologiske Undersøgelser ved den sydlige Del af Faxaflói paa Island. Af Prof. Dr. T. Thoroddsen.

Iceland—Archæology. *G. Tidskrift* 17 (1903-1094): 13-25. **Bruun.**
Udgravninger paa Island. Af Kaptajn Daniel Bruun. *With Illustrations.*

Iceland—Surveys. *G. Tidskrift* 17 (1903-1904): 1-12. **Lund-Larssen.**
Meddelelser om Generalstabens Triangulation paa Island i Sommeren 1902. Ved Kaptain Lund-Larssen. *With Map.*

Italy—Historical. **Detlefsen.**
Die Beschreibung Italiens in der Naturalis Historia des Plinius und ihre Quellen. Von Prof. Dr. D. Detlefsen. (Quellen und Forschungen zur alten Geschichte und Geographie, herausgegeben von W. Sieglin. Heft 1.) Leipzig: E. Avenarius, 1901. Size 10 × 6½, pp. 62.

Mediterranean—Cyprus. *P.I. Civil Engineers* 151 (1903): 334-340. **Bellamy.**
The Economic Construction and Maintenance of Roads in the Island of Cyprus. By Charles Vincent Bellamy.

Norway. *Alpine J.* 21 (1903): 396-408. **Ouston.**
In Lofoten and Vesteraalen. By T. G. Ouston. *With Map and Illustrations.*

Norway. **Wood.**
Norwegian By-ways. By Charles W. Wood. London: Macmillan & Co., 1903. Size 8 × 5½, pp. 384. *Illustrations. Price* 6s. *Presented by the Publishers.*

Portugal—Agriculture. *La G., B.S.G. Paris* 7 (1903): 245-277. **Flahault.**
L'économie agricole en Portugal. Par C. Flahault. *With Illustrations.*

Pyrenees. *Ann. Club Alpin Français* 28 (1901): 436-440. **Schrader.**
Note sur la Feuille 4 (et dernière) de la Carte des Pyrénées Centrales au 100,000e. Par M. F. Schrader.

Rhine. **Baedeker.**

The Rhine from Rotterdam to Constance. Handbook for Travellers by Karl Baedeker. Fifteenth Revised Edition. Leipsic: Karl Baedeker; London: Dulau & Co. 1903. Size 6½ × 4, pp. xxxiv. and 456. *Maps and Plans. Price* 7 *m. Two copies, one presented by the Editor, and the other by Messrs. Dulau & Co.*

Russia—Black Sea Coasts. **Sokolow.**

Verh. Russ.-K. Mineralog. Ges. St. Petersburg 40 (1902): 35-112.

Der Mius-Liman und die Entstehungszeit der Limane Süd-Russlands. Von Dr. N. Sokolow. *With Maps.*

Russia—Towns. *B.S.G. Lille* 39 (1903): 309-386. **Moriamé.**

En Russie. Les grandes villes de la Russie d'Europe. Par E. J. Soil de Moriamé. *With Illustrations.*

Sweden. ——

Svenska Turistföreningens Årsskrift för År 1903. Stockholm: Wahlström & Widstrand, 1903. Size 8¾ × 5½, pp. viii. and 448. *Illustrations. Price* 4 *kr. Presented by the Publishers.*

Switzerland—Grisons. *M. Antiquar. Ges. Zürich* 26 (1903): 1-80. **Heierli and Oechsli.**

Urgeschichte Graubündens mit Einschluss der Römerzeit. Von J. Heierli und W. Oechsli. *With Map and Illustrations.*

Switzerland—Simplon. *B.S.G. l'Est* 24 (1903): 23-29. **Papelier.**

Les voies d'accès au Simplon. Par A. Papelier.

Switzerland—Zermatt. **Whymper.**

The Valley of Zermatt and the Matterhorn. A Guide by Edward Whymper. Seventh Edition. London: John Murray, 1903. Size 7¼ × 5, pp. xiv. and 224. *Maps and Illustrations. Price* 3*s. net. Two copies, presented by the Author and Publishers.*

Turkey—Albania and Macedonia. **Šoštarić.**

Deutsch. Rundschau G. 25 (1903): 337-347.

Durch Albanien und Makedonien. Von Dr. M. Šoštarić. *With Illustration.*

Turkey—Gulf of Salonica. *Petermanns M.* 49 (1903): 91-93. **Philippson.**

Eisbildung auf der Bucht von Salonik im letzten Winter. Von A. Philippson. *With Map.*

United Kingdom—Ireland. *Nineteenth Century* 53 (1903): 876-882. **Sankey.**

A Future for Irish Bogs. By Sir R. H. Sankey, K.C.B.

United Kingdom—Ireland. **McCarthy.**

Ireland and Her Story. By Justin McCarthy. London: Horace Marshall & Son, 1903. Size 7 × 4, pp. 190. *Map. Price* 1*s.* 6*d. Presented by the Publishers.*

United Kingdom—Quarries. ——

Quarry 7 (1902): 749-752; 8 (1903): 77-83, 141-145.

The Whinstone and other Road Metal Quarries of the North of England. *With Maps and Illustrations.*

United Kingdom—Reading. **Blake.**

Memoirs of the Geological Survey. England and Wales. The Geology of the country around Reading. (Explanation of Sheet 268.) By the late J. H. Blake. With contributions by W. Whitaker. Edited by H. W. Monckton. London: E. Stanford, 1903. Size 10 × 6, pp. 92. *Illustrations. Presented by the Geological Survey.*

United Kingdom—Scotland. **Baddeley.**

Thorough Guide Series. Scotland (Part i.), Edinburgh, Glasgow, and the Highlands, as far north as Aberdeen, Inverness, Gairloch, and Stornoway, with a description of the various approaches by Land and Sea from the South. By M. J. B. Baddeley. Tenth Edition. London: Dulau & Co., 1903. Size 6½ × 4½, pp. 20, xxxii., and 318. *Maps and Plans. Price* 6*s.* 6*d. Presented by the Publishers.*

United Kingdom—Scotland. **Baddeley.**

Thorough Guide Series. Scotland (Part iii.), The "Lowlands," including Edinburgh and Glasgow, and all Scotland south of those places. By M. J. B. Baddeley. Fourth Edition. London: Dulau & Co., 1903. Size 6½ × 4½, pp. xii. and 186. *Maps and Plans. Price* 4*s. Presented by the Publishers.*

All the sectional maps are coloured in this edition, and a new plan of Ayr is given.

The two large scale section maps of the Ayr district are, however, omitted, though reference is still made to them in the appendix on coach tours, where some confusion seems also to have been introduced in the course of condensation.

United Kingdom—Scotland. **Various Authors.**

Memoirs of the Geological Survey. Scotland. The Geology of North Arran, South Bute, and the Cumbraes, with parts of Ayrshire and Kintyre. (Sheet 21, Scotland.) Glasgow; London: E. Stanford, 1903. Size 10 × 6, pp. viii. and 200. *Illustrations. Price 4s. Presented by the Geological Survey.*

ASIA.

Asia. *Deutsch. Rundschau G.* **25** (1903): 439-454. **Jüttner.**

Fortschritte der geographischen Forschungen und Reisen im Jahre 1902. I. Asien. Von Dr. J. M. Jüttner.

Central Asia. **Hedin and Dove.**

Meine letzte Reise durch Inner-Asien. Von Prof. Dr. Sven von Hedin. Mit einer Einleitung von Prof. Dr. Dove. Halle-a-S.: Gebauer-Schwetschke Druckerei und Verlag, 1903. Size 9½ × 6½, pp. xiv. and 50. *Map and Portrait. Presented by the Publisher.*

Ceylon—Veddas. *Globus* **83** (1903): 201-207, 220-223, 261-267. **Rütimeyer.**

Die Nilgalaweddas in Ceylon. Von. Dr. L. Rütimeyer. *With Illustrations.*

China—Terrestrial Magnetism. *B.S.G. Italiana* **4** (1903): 178-185. **Bertelli.**

Se da alcuni documenti si possa dedurre l'antica conoscenza della "Declinazione magnetica" presso i Cinesi. Nota del P. T. Bertelli.

China—Wei-Hai-Wei. *G. Teacher* **2** (1903): 66-70. **Bruce-Mitford.**

Wei-Hai-Wei. Some Physical Characteristics of our New Dependency in the Far East. By C. E. Bruce-Mitford. *With Map and Illustration.*

Chinese Empire—Tibet. *Z. Ges. Erdk. Berlin.* (1903): 344-358. **Hedin.**

Seen in Tibet. Von Dr. Sven v. Hedin. *With Illustrations.*

Chinese Turkestan. **Stein.**

Sand-Buried Ruins of Khotan. Personal Narrative of a Journey of Archæological and Geographical Exploration in Chinese Turkestan. By M. Aurel Stein. London: T. Fisher Unwin, 1903. Size 9 × 5½, pp. xliv. and 524. *Map and Illustrations. Price 21s. net. Presented by the Publishers.* [To be reviewed.]

French Indo-China. *Rev. G.* **52** (1903): 503-515. **De la Peyre.**

Les communications en Indo-Chine, voies fluviales et voies ferrées. Par Jean de la Peyre. *With Map.*

India. *Records Botan. Surv. India* **2** (1903): 231-370. **Prain.**

Flora of the Sundribuns. By D. Prain. *With Map.*

India—Bombay. ———

Magnetical, Meteorological, and Seismological Observations made at the Government Observatory, Bombay, in the Years 1900 and 1901, under the direction of N. A. F. Moos. With an Appendix. Bombay, 1903. Size 13½ × 10, pp. xxii., 40, 26, and 8. *Price 7s. Diagrams. Presented by the Indian Government.*

India—Sind. *J.S. Arts* **51** (1903): 593-610. **Birdwood.**

The Province of Sind. By H. M. Birdwood, C.S.I. *With Map.*

India—Surveys. ———

General Report on the Operations of the Survey of India administered under the Government of India during 1901-1902. Prepared under the direction of Colonel St. G. C. Gore. Calcutta, 1903. Size 13½ × 8½, pp. iv. and 62, and x. *Maps and Portrait. Price 3s. Presented by the Survey of India Department.*

India—Western Frontiers. *Imp. and Asiatic Quarterly Rev.* **15** (1903): 225-252. **Rees.**

The Western Frontiers of India. By J. D. Rees.

Indian Ocean. *Monthly Weather Rev.* **31** (1903): 127-133. **Harris.**

The semi-diurnal tides in the northern part of the Indian Ocean. By R. A. Harris. *With Diagrams.*

Japan. *J.G., Tōkyō G.S.* **14** (1902): 620-629. **Ogawa.**

Influences of Geographical Features on the Civilization of Japan. By Takudyi Ogawa. [In Japanese.]

Japan. *Deutsch. Rundschau G.* **25** (1903): 349-351. **Nishimura.**

Der Ausbruch des Torishima in Japan. Von M. Nishimura. *With Map and Illustrations.*

See account of the eruption in the *Journal* for May last.

Japan—Formosa. **Davidson**

The Island of Formosa, Past and Present. History, People, Resources, and Commercial Prospects. Tea, Camphor, Sugar, Gold, Coal, Sulphur, Economical Plants, and other productions. By James W. Davidson. London, etc.: Macmillan & Co., 1903. Size 11 × 8, pp. iii., 5, 646, xxviii., and 46. *Maps, Plates, and Illustrations. Price* 25*s. net. Presented by the Publishers.* [To be reviewed.]

Korea—Place-names. **Kotò and Kanazawa.**

A Catalogue of the Romanized Geographical Names of Korea. By B. Kotò and S. Kanazawa. Published by the University of Tōkyō, [1903]. Size 8 × 4½, pp. vi., 90, and 88. *Presented by the Authors.*

Malay Archipelago—Celebes. *Globus* **83** (1903): 277-281. **Sarasin.**

Ueber die Toála von Süd-Celebes. Von P. und F. Sarasin. *With Illustrations.*

Pamirs. *Izvestiya Imp. Russ. G.S.* **38** (1902): 273-305. **Fedchenko.**

Pamir and Shugnan. By B. A. Fedchenko. [In Russian.]

Philippine Islands. **Blair, Robertson, and Bourne.**

The Philippine Islands, 1493-1803. Explorations by Early Navigators, Descriptions of the Islands and their Peoples, their History, and Records of the Catholic Missions, as related in contemporaneous Books and Manuscripts, showing the Political, Economic, Commercial, and Religious Conditions of those Islands from their earliest relations with European Nations to the beginning of the Nineteenth Century. Translated from the Originals. Edited and Annotated by Emma Helen Blair and James Alexander Robertson, with historical introduction and additional notes by Edward Gaylord Bourne. Vol. i. 1493-1529 (pp. 358); vol. ii. 1521-1569 (pp. 339); vol. iii. 1569-1576 (pp. 318); vol. iv. 1576-1582 (pp. 329). Cleveland, Ohio: The A. H. Clark Co., 1903. Size 9½ × 6. *Maps, Portraits, and Illustrations. Price* $1 *net per volume.*

This important series will extend to 55 volumes, one to be issued each month.

Russia—Caucasia. *Ann. Club Alpin. Française* **28** (1901): 319-335. **Leprince-Ringuet.**

Souvenirs de Russie. Ascension du Grand-Ararat. Par M. F. Leprince-Ringuet. *With Illustrations.*

Russia—Caucasus. *Materials Topog., etc., Caucasus* **31** (1902): 49-96. **Han.**

Journey in Kakhetia and Daghestan in 1898. By K. F. Han. [In Russian.]

Russian Central Asia. *Zemleryedenie* **9** (1902): 71-75. **Anuchin.**

A former mouth of the Amu-Daria in the Caspian Sea. By D. Anuchin. [In Russian.]

Russia—Sakhalin. **Labbé.**

Paul Labbé. Un Bagne Russe. L'ile de Sakhaline. Paris: Hachette et C^ie^, 1903. Size 7½ × 4½, pp. 276. *Maps and Illustrations. Price* 4*fr. Presented by the Publishers.* [See review, *ante*, p. 318.]

Russia—Siberia—Amur. **Khlaponin and others.**

Explorations Géologiques dans les Régions aurifères de la Sibérie. Région aurifère de l'Amour. Livr. iii. St. Petersburg, 1902. Size 10 × 6½, pp. 171. *Maps.*

Russia—Siberia—Baikal. *Zemleryedenie* **9** (1902): 33-40. **Anuchin.**

Baikal (short sketch). By D. Anuchin. [In Russian.]

Russia—Siberia—Baikal. *Zemleryedenie* **9** (1902): 41-65. **Korotneff.**

Zoogeographical researches on Baikal. By A. Korotneff. [In Russian.] *With Map and Illustrations.*

Siam—Railways. *B. Comité l'Asie Française* **3** (1903): 142-145. ———

Les Chemins de fer au Siam et les rivalités anglo-allémandes. *With Map.*

Turkey—Baghdad Railway. *Missions Belges* **5** (1903): 117-131, 153-169. **Lammens.**

La future route des Indes. Par Père H. Lammens. *With Map and Illustrations.*

Turkey—Palestine. **Sanday and Waterhouse.**

Sacred Sites of the Gospels. By W. Sanday, with the assistance of Paul Waterhouse. Oxford: Clarendon Press, 1903. Size 9 × 5½, pp. xii. and 126. *Maps,* *Plans, and Illustrations. Price 13s. 6d. net. Presented by the Delegates of the Clarendon Press.*

Turkey—Syria. *Asien* **2** (1903): 107-109, 125-128. **Schlagintweit.**

Die Häfen der syrischen Küste und die Deutsche Levante-Linie. Von Major Max Schlagintweit. *With Map.*

AFRICA.

British Central Africa. *Scottish G. Mag.* **19** (1903): 311-315. **Henderson.**

The Nyasa Coal Bed. By Rev. James Henderson. *With Illustrations.*

British East Africa. **[Eliot.]**

Africa No. 6 (1903). Report by His Majesty's Commissioner on the East Africa Protectorate. London: Eyre & Spottiswoode, 1903. Size 13½ × 8½, pp. 48. *Price* 5*d.*

See note in the Monthly Record (*ante*, p. 330).

Canary Islands. **Taquin.**
B.S.R. Belge G. **26** (1902): 28, 131, 266, 315, 405, 502; **27** (1903): 37.

Les Iles Canaries et les Parages de Pêche Canariens. Par Dr. A. Taquin. *With Maps and Illustrations.*

Central Africa. **Moore.**

The Tanganyika Problem. An Account of the Researches undertaken concerning the existence of Marine Animals in Central Africa. By J. E. S. Moore. London: Hurst & Blackett, Ltd., 1903. Size 9½ × 6½, pp. xxiv. and 372. *Maps and Illustrations. Presented by the Publishers.*

Reviewed in vol. xxi. (p. 288).

Central Africa—Tanganyika. **Dupont.**
Miss. Catholiques **35** (1903): 56-59, 65-69, 76-80.

Souvenirs du Tanganika. Par Mgr. Dupont. *With Illustrations.*

Central Africa—Zoology. *P. Zoolog. S.* (1902, II.): 339-350. **Major.**

On a Specimen of the Okapi lately received at Brussels. By C. I. Forsyth Major. *With Illustrations.*

Congo State. *Mouvement G.* **20** (1903): 103-106. **Du Bourg.**

L'expédition du Bourg de Bozas dans le bassin de l'Uele. *With Map.*

Egypt. **Abbate.**

Dr. Abbate Pacha. Le Reservoir D'Assouan et le projet du Canal Abbas au point de vue sanitaire. Le Caire, 1903. Size 9½ × 6½, pp. 16.

The author considers that risk to health will arise from the stagnant water held up by the reservoir.

Egypt. **Beadnell.**

Neolithic Flint Implements from the Northern Desert of the Fayûm, Egypt. By Hugh J. L. Beadnell. (Extracted from the *Geological Magazine*, N.S., Decade iv. vol. x. pp. 53-59, February, 1903.) London: Dulau & Co. Size 8½ × 5½. *Plates. Presented by the Author.*

Egypt. *Tour du Monde* **9** (1903): 301-312. **Beaumont.**

L'Irrigation de l'Égypte et les nouveaux Barrages d'Assouan et d'Assiout. Par Gaston du Boscq de Beaumont. *With Illustrations.*

Egyptian Sudan. *Monthly Rev.* 11 (1903): 89-99. **Ward.**

The Wonders of the Sudan. By J. Ward. *With Illustrations.*

Eritrea. *B.S.G. Italiana* **4** (1903): 76-109. **Tancredi.**

Sul clima di Addi-Ugri (Colonia Eritrea). Nota del capitano A. M. Tancredi.

French Congo. **Morel.**

The British Case in French Congo. The Story of a Great Injustice, its Causes, and its Lessons. By Edmund D. Morel. London: W. Heinemann, 1903. Size 8 × 5, pp. xxii. and 216. *Map. Price* 6*s.*

French Congo—Ogowe. *Ann. G.* **12** (1903): 159-171. **Haug.**

Le Bas Ogooué, notice géographique et ethnographique. Par E. Haug. *With Map.*

The various interlacing arms of the Ogowe, and the lakes communicating with them, are shown on the map on the large scale of 1 : 250,000.

German East Africa. **Adams.**
Lindi und sein Hinterland. Von P. Adams. Berlin: D. Reimer, (N.D.). Size 9½ × 6½, pp. 72. *Maps and Illustrations. Price* 1*s.* 6*d.*

German South-West Africa. **Hartmann.**
Beiträge Kolonialpolitik 4 (1902-1903): 399-430.
Meine Expedition 1900 ins nördliche Kaokofeld und 1901 durch das Amboland. Von Dr. G. Hartmann. *With Illustrations.* [See note, *ante*, p. 331.]

Hausa Language. **Brooks and Nott.**
Bátū na Abūbuan Hausa. With Translation, Vocabulary and Notes. By W. H. Brooks and Lewis H. Nott. London: Henry Frowde, 1903. Size 7½ × 5, pp. 56. *Price* 3*s.* 6*d. net. Presented by the Publishers.*

Short writings by a Hausa on Hausa customs and industries.

Ivory Coast. *Ann. G.* **12** (1903): 145-158. **Cassel.**
Géographie économique de la Haute Côte d'Ivoire Occidentale. Par C. Van Cassel. *With Map.*

Ivory Coast and Liberia. *Ann. G.* **12** (1903): 130-144. **d'Ollone.**
Côte d'Ivoire et Libéria. Variations cartographiques relatives à ces contrées et état actuel de nos connaissances. Par le capitaine d'Ollone. *With Maps.*

Kamerun. *Globus* **83** (1903): 284-285. **Schkopp.**
Zwergvölker in Kamerun. Von E. v. Schkopp.

Madagascar. *La G., B.S.G. Paris* **7** (1903): 278-283. **Gallieni.**
Diégo Suarez. La Route de la Montagne d'Ambre. Par Général Gallieni.

Madagascar. ———
Guide-Annuaire de Madagascar et Dépendances, Année 1903. Tananarive, 1903. Size 9 × 6, pp. x. and 846. *Maps and Plates. Presented by the French Colonial Office.*

Mauritius. **Anderson.**
Esquisse de l'Histoire du Protestantisme à l'Ile Maurice et aux Iles Mascarègnes 1505 à 1902. Thèse par J. F. Anderson. Paris: Société Française d'Imprimerie et de Libraire, 1903. Size 10 × 6½, pp. 96. *Map and Illustrations. Presented by the Author.*

Morocco. *Ann. G.* **12** (1903): 120-129. **Segonzac.**
Voyages au Maroc (1899-1901). Par le Marquis de Segonzac.

Niger. **Lenfant.**
Capitaine Lenfant. Le Niger voie ouverte à notre Empire Africain. Préface par M. E. Étienne. Introduction du Colonel Peroz. Paris: Hachette & Cie., 1903. Size 10 × 6½, pp. vii. and 256. *Map and Illustrations. Price* 10*s.*

Nile. **Henze.**
Der Nil, seine Hydrographie und wirtschaftliche Bedeutung. Von Dr. H. Henze. (Angewandte Geographie, I. Serie, 4 Heft.) Halle-a.-S., 1903. Size 10 × 6½, pp. 104.

Rhodesia. *Rev. G.* **52** (1903): 421-435. **Maitre.**
North-Eastern Rhodesia. Lobemba et Lobisa. Par H. Maitre. *With Map.*

Cf. Article in *Journal* for July, 1902.

Rhodesia. *Quarterly J. Geolog. S.* **59** (1903): 266-291. **Molyneux.**
The Sedimentary Deposits of Southern Rhodesia. By A. J. C. Molyneux. With Appendices by Dr. A. S. Woodward, Dr. W. Hind, and E. A. N. Arbor. *With Map, Sections, and Plate.*

Sahara. **Dürkop.**
Die wirtschafts- und handels-geographischen Provinzen der Sahara, begründet durch nützliche Pflanzen. Inaugural-Dissertation . . . von Erich Dürkop. Wolfenbüttel, 1902. Size 9 × 6, pp. 58.

Sahara—Tawarek. **King.**
A Search for the Masked Tawareks. By W. J. Harding King. London: Smith, Elder & Co., 1903. Size 8½ × 5½, pp. viii. and 334. *Maps and Illustrations. Price* 12*s.* 6*d.* net. *Presented by the Publishers.*

Sokotra. **Kossmat.**
Geologie der Inseln Sokótra, Sémha und 'Abd el Kûri. Von Dr. Franz Kossmat. Wien, 1902. Size 12½ × 9½, pp. 62. *Map and Plates. Presented by the Author.*

Somaliland. **Ferrandi.**
Seconda Spedizione Bòttego. Lugh: Emporio Commerciale sul Giuba. Memorie e note di U. Ferrandi. A cura e spese della Società Geografica Italiana. Roma, 1903. Size 10 × 7, pp. xvi. and 434. *Maps and Illustrations. Price* 12 lire. *Presented by the Italian Geographical Society.*

Somalis. **Ferrand.**
Matériaux d'études sur les pays Musulmans. Les Comâlis, par Gabriel Ferrand. Paris: E. Leroux, 1903. Size 7½ × 5, pp. xiv. and 284. *Price* 4*s*. 6*d*.

South Africa. **Diesterweg.**
Aus dem Pionier-Leben während meines 20-jährigen Aufenthaltes in Süd Afrika. Von Moritz Diesterweg. Burg.: A Hopfer, 1902. Size 8½ × 5½, pp. viii. and 227. *Map and Illustrations. Price* 3 *m. Presented by the Publishers.*

Sudan. *C. Rd.* **136** (1903): 1118-1120. **Lapparent.**
Sur les traces de la mer lutétienne au Soudan. Note de M. de Lapparent.

Cf. note in Monthly Record for August.

Sudan. *B.S.G. Lille* **39** (1903): 414-443. **Meynier.**
La France dans l'Afrique Centrale. Mission Joalland-Meynier. Par le Capitaine Meynier. *With Map.*

Tripoli. **Mathuisieulx.**
À Travers la Tripolitaine. Par H. M. de Mathuisieulx. Préface de M. L. Bertrand. Paris: Hachette & Cie, 1903. Size 7½ × 4½, pp. vii. and 302. *Illustrations. Price* 4 *fr. Presented by the Publishers.*

Uganda. **Woodward.**
Précis of Information concerning the Uganda Protectorate. Compiled in the Intelligence Division, War Office. By Brevet-Major E. M. Woodward. London, 1902. Size 9½ × 6, pp. 160. *Maps. Price* 5*s*. 6*d*. *Presented by the Intelligence Division, War Office.*

A useful summary of our knowledge of the Uganda protectorate, with hints as to outfit, etc. There is a large-scale map (10 miles to an inch) in four sheets, but this was prepared in 1900, and is consequently not quite up-to-date.

West Africa—Cotton. **Baillaud.**
Renseignements Colon., Comité l'Afrique Française **2** (1903): 37-44.
L'exploitation du Coton en Afrique occidentale. Par E. Baillaud.

NORTH AMERICA.

Alaska. **Brooks.**
Preliminary Report on the Ketchikan Mining District, Alaska, with an Introductory Sketch of the Geology of South-Eastern Alaska. By A. H. Brooks. (Dep. of the Interior, United States Geological Survey. Professional Paper, No. 1.) Washington, 1902. Size 11½ × 9, pp. 120. *Maps. Presented by the U.S. Geological Survey.*

Canada. *Monthly Rev.* **11** (1903): 91-108. **Haultain.**
Who should Emigrate to Canada? By T. A. Haultain. *With Illustrations.*

Canada—Nova Scotia. **Ells.**
P. and T. Nova Scotian I. Sci. **10** (1901-1902): 433-446.
The Progress of Geological Investigation in Nova Scotia. By Dr. R. W. Ells.

Canada—Rocky Mountains. *Appalachia* **10** (1903): 142-165. **Outram.**
Climbs among the Highest Canadian Rockies: Mounts Columbia, Lyell, Bryce, and others. By J. Outram. *With Plates.*

Canada—Rocky Mountains and Selkirks. *Appalachia* **10** (1903): 179-186. ———
Bibliography of the Rocky Mountain and Selkirk Ranges: British Columbia and Alberta.

Canada—Selkirk Range. *Appalachia* **10** (1903): 123-135. **Wheeler.**
Behind the Asulkan and Donkin Passes. By A. O. Wheeler. *With Map and Plates.*

Mexico—Popocatepetl. *Deutsch. Rundschau G.* **25** (1903): 433-439. **Lemcke.**
Eine Besteigung des Vulkans Popocatepetl in Mexiko. Von H. Lemcke. *With Illustrations.*

United States. **Bennett.**
Trade, Agriculture, etc., of the States of California, Nevada, Utah, and Arizona for the year 1902. Foreign Office, Annual No. 2988, June, 1903. Size 9½ × 6, pp. 60. *Price 3d.*

United States—Blue Ridge. *B.G.S. Philadelphia* **3** (1903): 213–244. **Davis.**
The Stream Contest along the Blue Ridge. By W. M. Davis. *With Illustrations.*

United States—Kansas. *J.G.* **2** (1903): 155–158. **Hollister.**
A curious Salt Pond in Kansas. By G. B. Hollister. *With Illustrations.*

United States—Meteorology. *J.G.* **2** (1903): 124–136. **Burrows.**
The Chinook Winds. By A. T. Burrows. *With Diagrams.*

United States—Minnesota. **Hall.**
Geography and Geology of Minnesota. Vol. i. Geography of Minnesota. By Christopher Webber Hall. Minneapolis: H. W. Wilson Company, 1903. Size 7½ × 5, pp. xii. and 300. *Maps and Illustrations. Presented by the Publishers.*

United States—New Jersey. **Harshberger.**
P.A. Nat. Sci. Philadelphia **54** (1902): 642–669.
Additional Observations on the Strand Flora of New Jersey. By J. W. Harshberger.

United States—New York. *J.G.* **2** (1903): 115–124. **Carney.**
A Type Case in Diversion of Drainage. By F. Carney. *With Maps and Illustrations.*

United States—North Carolina. **Weaver.**
Internal Improvements in North Carolina previous to 1860. By C. C. Weaver, PH.D. (Johns Hopkins University Studies. Series xxi. Nos. 3–4.) Baltimore, 1903. Size 10 × 6, pp. 96.
Rivers, canals, and railways are treated of in turn.

United States—Texas. *T. Texas A. Sci.* **4** (1901): pp. 4 and 8. **Dumble.**
The Red Sandstone of the Diabolo Mountains, Texas. Cretaceous and Later Rocks of Presidio and Brewster Counties. By E. T. Dumble.

United States—Texas. *T. Texas A. Sci.* **3** (1899): 17-296. **Simonds.**
A Record of the Geology of Texas for the Decade ending December 31, 1896. By Dr. F. W. Simonds.

United States—Texas. *T. Texas A. Sci.* **4** (1901): pp. 48. **Taylor.**
The Water Power of Texas. By T. U. Taylor. *With Illustrations.*

United States—Texas. *T. Texas A. Sci.* **4** (1900): 59–80. **Thompson.**
The Development of the present Texas Railway System. By R. A. Thompson.

CENTRAL AND SOUTH AMERICA.

Argentine Republic. *B.A. Nac. Ci. Cordoba* **17** (1902): 203–261. **Bodenbender.**
Contribucion al conocimiento de la precordillera de San Juan, de Mendoza y de las sierras centrales de la República Argentina. Por G. Bodenbender. *With Sections.*

Argentine Republic. **Nordenskiöld.**
Präcolumbische Wohn- und Begräbnisplätze an der Süd-Westgrenze von Chaco. Von E. Nordenskiöld. (K. Svenska Vetenskaps-Akademiens Handlingar. Bandet 36, No. 7.) Stockholm: P. A. Norstedt & Söner, 1903. Size 12 × 9½, pp. 22. *Map and Illustrations. Presented by the Author.*

Argentine Republic. *B. American G.S.* **35** (1903): 130–143. **Smith.**
The Economic Geography of the Argentine Republic. By J. R. Smith. *With Map.*

Bolivia. *B. Oficina Nac. Inmigración, etc., La Paz* **2** (1902): 815–818. **Varnoux.**
Descripcion fisica de la cadena de Apolobamba. Por L. Varnoux.

Bolivia. *B. Oficina Nac. Inmigracion, etc., La Paz* **2** (1902): 753–780. ———
El primer censo decenal de la poblacion de Bolivia. Sus resultados generales. Censo del Departamento de Santa-Cruz.

Bolivia—Acre. **Medina.**

Angel Diaz de Medina. La Cuestion del Acre. El Derecho Boliviano y la Circular de Sr. Baron de Rio Branco. La Paz, 1903. Size 8 × 5½, pp. 57. *Map. Presented by Sr. M. V. Ballivian.*

Bolivia—Desaguadero. ——

B. Oficina Nac. Inmigración, etc., La Paz **2** (1902): 787–789.

La Navegacion del Desaguadero.

Brazil and Argentine Republic. **Barclay.**

To the falls of the Iguazú. By William S. Barclay. Buenos Aires. The South American Bank Note Co., 1903. Size 10½ × 7, pp. 48. *Map and Illustrations. Two Copies. Presented by the Author.*

AUSTRALASIA AND PACIFIC ISLANDS.

Australia. *B.S.G. Italiana* **4** (1903): 204–917. **Grasso.**

Australiani indigeni ed Australiani britannici di fronte alle svantaggiose condizioni geografiche del loro continente. Appunti statistici del prof. G. Grasso.

Contrasts the development of Australia by civilized man with the backward conditions which prevailed under its native inhabitants.

Australia. **Moore.**

Moore's Australian Almanac and Country Directory for the year 1903. Sydney: Kealy & Philip. Size 7½ × 5, pp. xvi., 152, and 182.

Australia—Geology. **Thomson.**

The Physical Geography of Australia: V. Geology. By J. P. Thomson. (Reprinted from *Proceedings and Transactions of the R.G.S. of Australasia, Queensland*, vol. xviii.) Size 10 × 6, pp. 32. *Presented by the Author.*

Caroline Islands. *Deutsch. Kolonialblatt* **14** (1903): 364–366. **Berg.**

Bericht des Vizegouverneurs Berg über einen Besuch der Trukinseln (Ostkarolinen).

Gilbert Islands. *Records Australian Museum* **5** (1903): 1–15. ——

Notes on the Zoology of Paanopa or Ocean Island and Nauru or Pleasant Island, Gibert Group.

New Zealand—Chatham. *Globus* **83** (1903): 325–326. **Schurtz.**

Die Herkunft der Moriori. Von Dr. Heinrich Schurtz.

The late Dr. Schurtz's researches have confirmed the native tradition, and shown that the Moriori are a Polynesian race akin to the Maori, but exhibiting a further mixture with the aboriginal dark race of this region.

Ocean Island. *Geolog. Mag.* **10** (1903): 2 8-300. **Reed.**

Notes on Ocean Island (Banaba). By F. R. Cowper Reed.

Queensland. **Dixon.**

Queensland. Department of Mines. Index No. 2 to Names of Places, Mines, Reefs, etc., occurring in the Geological Survey Reports, Queensland, Nos. 136 to 177 (inclusive) By Russell Dixon. Brisbane: G. A. Vaughan, 1902. Size 10 × 6, pp. 38.

Samoa—Climate. *Ann. Hydrographie* **31** (1903): 193–204. **Burchard.**

Das Klima von Apia (Samoa-Inseln) nach 10 jährigen meteorologischen Aufzeichnungen von Dr. Funk dargestellt von Dr. O. Burchard.

South Australia. ——

1899. Meteorological Observations, made at the Adelaide Observatory and other places in South Australia and the Northern Territory during the year 1899, under the direction of Charles Todd. Adelaide: C. E. Bristow, 1902. Size 13 × 8, pp. xvi., 96, and 92. *Charts. Presented by the Government Astronomer, Adelaide Observatory.*

Torres Straits. ——

Reports of the Cambridge Anthropological Expedition to Torres Straits. Volume ii. Physiology and Psychology. Part i. Introduction and Vision. Part ii. Hearing, Smell, Taste, Cutaneous Sensations, Muscular Sense, Variations of Blood-pressure, Reaction-Times. Cambridge: University Press, 1901–3. Size 11½ × 9, pp. vi. and 1–224. *Maps. Price, Part i., 9s. net; Part ii., 7s. net. Presented by the Syndics of the Cambridge University Press.*

POLAR REGIONS.

Antarctic—Expeditions. *Scottish G. Mag.* **19** (1903): 370-376. ——
The Antarctic Expeditions. *With Charts.*

Arctic—Abruzzi Expedition. *Tour du Monde* **9** (1903): 145-228. **Prior.**
L'Étoile Polaire dans la Mer Arctique (1899-1900). Par S. A. R. le Duc des Abruzzes. Traduit et résumé par H. Prior. *With Maps and Illustrations.*

Arctic—Abruzzi Expedition. **Ricchieri.**
Prof. Giuseppe Ricchieri. La *Stella Polare* nel Mare Artico. Relazione sui risultati della spedizione di S. A. R. il Duca degli Abruzzi. Messina, 1903. Size 9½ × 6½, pp. 80. *Presented by the Author.*

Arctic—Baldwin-Ziegler Expedition. **Baldwin.**
Wide World Mag. **10** (1903): 396-402, 432-436, 587-593.
The Baldwin-Ziegler Polar Expedition. By E. Briggs Baldwin. *With Illustrations.*

Arctic—Ice Conditions. **Garde.**
The State of the Ice in the Arctic Seas, 1902. Prepared by V. Garde. (Special print of the nautical-meteorological annual of the Danish Meteorological Institute.) Size 12½ × 9½, pp. xxii. *Maps.*

Arctic—Ice and Navigation. *Izvestiya Imp. Russ. G.S.* **38** (1902): 306-341. **Varnek.**
Distribution of Ice and the Condition of the Navigation to Siberia. By A. T. Varnek. [In Russian.] *With Maps.*

This has been noticed in the Monthly Record.

Arctic—Russian Expedition. **Kolomeitsoff.**
Izvestiya Imp. Russ. G.S. **38** (1902): 342-369.
The Russian Polar Expedition of Baron Toll. By N. N. Kolomeitsoff.

MATHEMATICAL GEOGRAPHY.

Astronomy. *Ann. Hydrographie* **31** (1903): 211-222. **Wedemeyer.**
Zur Höhenberechnung. Von A. Wedemeyer.

Cartography. *J.S. Arts* **51** (1903): 552-563. **Morrison.**
The Construction of Maps and Charts. By G. J. Morrison. *With Diagrams.*

Latitudes and Longitudes. ——
Accessions (No. vii.) to collection of Latitudes and Longitudes. Map Room. Intelligence Division, W.O. December, 1902. Size 12½ × 10, pp. 42.

Navigation. *B.S.G. Italiana* **4** (1903): 119-132. **Roncagli.**
Per la definizione della Lossodromia. Note esplicative del Comandante G. Roncagli.

Navigation. ——
On the Station Pointer and the manner of fixing a Ship's Position by its aid. Second Edition. London: J. D. Potter, 1903. Size 8½ × 5½, pp. 10. *Diagrams. Price 6d. Presented by the Hydrographer, Admiralty.*

Navigation. *B.S.G. Italiana* **4** (1903): 259-262. **Porena.**
Per la definizione della lossodromia. Del prof. F. Porena.

Surveying. **Duplessis.**
Traité du Nivellement, comprenant les Principes Généraux, la description et l'usage des Instruments, les Opérations et les Applications. Par J. Duplessis. Troisième édition. Paris. C. Béranger. 1903. Size 9 × 5½, pp. xiv. and 342. *Diagrams. Price 8s. 6d.*

Surveying. *M.K.K. Militär-G.I.* **22** (1902): 139-154. **Hübl.**
Die Stereophotogrammetrie. Von A. Freiherrn von Hübl.

Surveying. *M.K.K. Militär-G.I.* **22** (1902): 41-109. **Weixler.**
Directiven zur Ausgleichung trigonometrischer Messungen auf analytischgeometrischer Grundlage. Verfasst und mit Beispielen erläutert von A. Weixler. *With Diagram.*

PHYSICAL AND BIOLOGICAL GEOGRAPHY.

Geophysics. **Ekman.**

Om jordrotationens inverkan på vindströmmar i hafvet. Af V. W. Ekman. Stockholm, 1902. Size 9½ × 6, pp. 28.

Geophysics. *C. Rd.* **136** (1903): 1172–1173. **Lippmann.**

Sur la distribution de la matière à la surface de la Terre. Note de G. Lippmann.

Gravity Determination. **Hecker.**

Bestimmung der Schwerkraft auf dem Atlantischen Ozean sowie in Rio de Janeiro, Lissabon und Madrid. Von O. Hecker. (Veröffentlichung des Königl. Preussischen Geodätischen Institutes, N.F. No. 11.) Berlin: P. Stankiewicz, 1903. Size 11½ × 9, pp. vi. and 138. *Plates.*

Hydrology. *C. Rd.* **136** (1903): 1511–1517. **Boussinesq.**

Sur le débit, en temps de sécheresse, d'une source alimentée par une nappe d'eaux d'infiltration. Note de J. Boussinesq.

ANTHROPOGEOGRAPHY AND HISTORICAL GEOGRAPHY.

Commerce. *B.S.G. Com. Paris* **25** (1903): 97–108. **Barthélemy.**

Les points stratégiques commerciaux. Par M. le Marquis de Barthélemy.

Æneas Sylvius. **Berg.**

Enea Silvio de' Piccolomini (Papst Pius II.) in seiner Bedeutung als Geograph. Ein Beitrag zur Geschichte der Erdkunde im Quattrocento. Inaugural-Dissertation . . . von Alfred Berg. Halle-a.-S., 1901. Size 9 × 6, pp. 46.

Historical—Chinese Explorer. *Globus* **83** (1903): 293–294. **Stenz.**

Général Tschan-t'chien, ein chinesischer Forschungsreisender des zweiten Jahrhunderts. Von P. G. M. Stenz.

Historical – St. Helena. *Blackwood's Mag.* **173** (1903): 621–633. **Clifford.**

The Earliest Exile of St. Helena. By Hugh Clifford, C.M.G.

The exile referred to is Fernão Lopez, a renegade who was left on St. Helena early in the sixteenth century.

Historical—Toscanelli and Columbus. **Markham and Vignaud.**

Toscanelli and Columbus. A Letter from Sir Clements R. Markham and a Reply from Mr. Henry Vignaud. London: Sands & Co., 1903. Size 10 × 6½, pp. 40.

Historical—Toscanelli and Columbus. *B.S.R. Belge G.* **27** (1903): 158-176. **Mees.**

La lettre de Toscanelli à Christophe Colomb. Par Dr. J. Mees.

Historical Geography. *Ann. G.* **12** (1903): 172–175. **Girardin.**

Sur un projet de Corpus topographique du monde ancien. Par P. Girardin.

On a proposed dictionary of ancient place-names and geographical terms down to 1200 A.D.

Political Geography—Boundaries. *B. American G.S.* **35** (1903): 147–159. **Russell.**

Geography and International Boundaries. By I. C. Russell.

Telegraph Cables. *Rev. Française* **28** (1903): 207–230, 261–286. **Gamard.**

Les Cables télégraphiques sous-marins. Par L. Gamard.

Telegraph Cables. *Rev. G.* **52** (1903): 436–450. **Brisse.**

Le réseau mondial de câbles sous-marins. Par A. Brisse. *With Map.*

BIOGRAPHY.

Jankó. *Deutsch. Rundschau G.* **25** (1903): 471–473. **Thirring.**

Dr. Johann Jankó. Von Dr. G. Thirring. *With Portrait.*

Livingstone. *Deutsch. Rundschau G.* **25** (1903): 403-406. **Dürr.**

David Livingstone. (Zur Erinnerung an die dreissigjährige Wiederkehr seines Todestages.) Von L. Dürr.

GENERAL.

Berlin Geographical Society. **Hellmann.**
Verh. Ges. Erdk. Berlin, N.S. 2 (1903): 328–343.

Fest-Sitzung zur Feier des 75-jährigen Bestehens der Gesellschaft für Erdkunde zu Berlin am 4 Mai, 1903. Ansprache des Vorsitzenden.

See note, *ante*, p. 219.

Educational. *G. Teacher* 2 (1903): 48–66. **Morgan.**

The Scope and Practical Teaching of Geography in Schools. By Dr. A. Morgan. *With Illustrations.*

Educational. **Reclus.**

L'Enseignement de la Géographie. Par Élisée Reclus. (Extrait du No. 1 [1903] du *Bulletin de la Société Belge d'Astronomie.*) Bruxelles. Size 10 × 6½, pp. 10. *Presented by the Institut Géographique, Brussels.*

Encyclopædia Britannica. ———

An Index to the complete Encyclopædia Britannica, being the Eleventh of the New Volumes which constitute, in conjunction with the Existing Volumes of the Ninth Edition, the Tenth Edition of that work. Volume xxxv. of the complete work. London, 1903. Size 12½ × 9, pp. 1092.

German Colonies. **Buchanan.**

Report for the year 1901–02 on the German Colonies. Foreign Office, Annual No. 2983, 1903. Size 10 × 6½, pp. 30. *Price 2d.*

German Colonies. ———

Denkschrift über die Entwickelung der deutschen Schutzgebiete in Afrika und der Südsee, Berichtsjahr 1. April 1901 bis 31. März 1902. Ditto. Anlagen. Size 12 × 9, pp. 122, 432.

German Colonies. ———

Die deutsche Kolonial-Gesetzgebung. Sammlung der auf die deutschen Schutzgebiete bezüglichen Gesetze, Verordnungen, Erlasse und internationalen Vereinbarungen mit Anmerkungen, Sachregister. Sechster Teil, 1901 bis 1902. Berlin: E. S. Mittler u. Sohn, 1903. Size 9½ × 6½, pp. xxii. and 674. *Price 13s. 6d.*

Index. **Scherman.**

Register zu den Jahresberichten der Geographischen Gesellschaft in München, 1871–1902. Bearbeitet von dem derzeitigen Bibliothekar, Prof. Dr. L. Scherman. Size 9 × 6, pp. 56. *Presented by the Author.*

Portuguese Colonies. **Vasconcellos.**

As Colonias Portuguezas. Geographia Physica, Politica e Economica. Por Ernesto J. de C. e Vasconcellos. 2ª Edição correcta e augmentada. Lisboa, 1903. Size 8 × 5½, pp. 472. *Maps. Presented by the Author.*

The first edition of this useful work appeared in 1896. It has now been revised and brought up to date.

Topography. **Lébédev.**

Codex 286 du Vatican. Récits de Voyages d'un Arabe. Traduction de l'Arabe par Mme Olga de Lébédev. St. Petersbourg, 1903. Size 10½ × 7, pp. 106 and ii. *Price 3s.*

Contains descriptions of Jerusalem, Rome, and other cities.

Travel. **Del Mar.**

Around the World through Japan. By Walter Del Mar. London: A. & C. Black, 1903. Size 9 × 5½, pp. xviii. and 434. *Illustrations. Price 18s. Presented by the Publishers.*

Year-book. **Haack and others.**

Geographen-Kalender. In Verbindung mit Dr. Wilhelm Blankenburg, Prof. Paul Langhans, Prof. Paul Lehmann und Hugo Wichmann herausgegeben von Dr. Hermann Haack. Erster Jahrgang 1903–1904. Gotha: Justus Perthes, 1903. Size 6½ × 4, pp. xxi., 320, and 124. *Portrait. Presented by the Publishers.*

A most useful work of reference, including kalendar with geographical tables, sections on the events of the year in the field of geography and world-politics, statistical information on the various countries, and the names and addresses of geographers throughout the world.

NEW MAPS.

By **E. A. REEVES**, *Map Curator*, **R.G.S.**

EUROPE.

Central Europe. **Liebenow and Ravenstein.**

Liebenow - Ravenstein's Special - Radfahrerkarte von Mittel - Europe. Scale 1 : 300.000 or 4·7 stat. miles to an inch. Sheets: 42, Alkmaars; 55, Amsterdam; 115, Nürnberg; 128, Stuttgart; 129. Ingolstaat; 140, Colmar; 141, Freiburg; 142, Ulm. Frankfurt-a-M.: Ludwig Ravenstein, 1903.

Dolomite Alps. **Freytag.**

G. Freytag's Touristen - Wanderkarte der Dolomiten (Östliches Blatt) mit markierten Wegen. Scale 1: 100,000 or 1·5 stat. mile to an inch. Vienna and Leipzig: G. Freytag & Berndt. *Presented by the Publishers.*

A tourists' map, showing principal roads and paths in red. It is printed in colours, and the relief is very effectively shown by shading.

England and Wales. **Ordnance Survey.**

ORDNANCE SURVEY OF ENGLAND AND WALES:—Sheets published by the Director-General of the Ordnance Survey, Southampton, from July 1 to 31, 1903.

4 miles to 1 inch:—

Hill-shaded map, printed in colours, in sheets, 15, 18. 1*s.* 6*d.* *each.*

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25-inch—County Maps (first revision):—

Cambridgeshire, LVIII. 12; **Dorset,** XI. 6; XIX. 8, 9, 10; XX. 2; XXIX. 2, 10; XXXVII. 1. **Gloucestershire,** XVI. 3, 4, 8, 16; XXIII. 16; XXIV. 1; XXVI. 3, 12; XXXI. 8; XLV. 2, 3, 14; XLVII. 11; LIII. 3; LXV. 9; LXVII. 3, 10, 11, 12, 14, 15. 16; LXX. 5. **Leicestershire,** XI. 8; XII. 6, 11; XVI. 16; XVII. 11, 15; XXIII. 7; XXVIII. 10; XXIX. 7, 13; XXX. 7; XXXIV. 4, 8; XXXV. 3, 8, 9; XXXVI. 2, 3, 5, 7. 10, 14; XLIII. 3, 14, 15; XLVIII. 3, 7. **Radnorshire,** IV. 13; V. 5; XV. 11; XVI. 1, 2, 5, 10. **Shropshire,** LXVIII. 5; LXX. 13; LXXII. 13, 14; LXXIII. 9; LXXVI. 4, 8; LXXVII. 5; LXXVIII. 2, 4; LXXX. 5. **Somerset,** VI. 9, 14; IX. 11, 12, 15; X. 1, 13. 15, 16; XII. 5; XVI. 7; XVII. 4, 7, 15; XLV. 3, 11; XLVI. 9; LXIII. 12; LXV. 2; LXXII. 4, 10; LXXIII. 5, 6; LXXIV. 11; LXXX. 3; LXXXI. 10, 12; LXXXII. 14; LXXXIX. 9; XC. 1, 6; XCII. 1, 2, 3, 4, 6, 8, 9, 10; XCIII. 2. **Staffordshire.** LXI. 7, 16; LXIII. 13. 14; LXVI. 3; LXX. 2; **Suffolk,** LXXXIII. 16; LXXXIV. 9, 10, 13, 14; LXXXIX. 4, 7. 8; XC. 1, 2, 5. **Warwickshire,** III. 10, 13; IV. 11; V. 9, 16; IX. 15; X. 9, 10. 3*s.* *each.*

4 miles to 1 inch—Miscellaneous Maps:—

Manœuvre Map, South of England (parts of sheets 15, 19, and 23), 2*s.*, mounted on linen, flat in sheets or folded in covers (boundary printed in colour).

(*E. Stanford, London Agent.*)

England and Wales. **Gall and Inglis.**

The "Strip" Route Maps. Scale 1 : 127,260 or 2 stat. miles to an inch. Nos.: 5, The Exeter Road; 19, The Liverpool and Manchester Roads; 21, The Carlisle Road. Edinburgh and London: Gall & Inglis. *Price 1s. each. Presented by the Publishers.*

These form Nos. 5, 19, 21 of Gall and Inglis' series of "Strip" Route-maps, and will doubtless prove useful to tourists travelling by motor or cycle. They show the main roads in brown, and a few miles of the country on either side. A vertical section is given by the side of the road, showing distances and the rise and fall of the ground.

ASIA.

Korea. **Kotô.**

Korea. Scale 1 : 2,000,000 or 31·5 stat. miles to an inch. Compiled and transliterated by B. Kotô, PH D. Tokyo: Maruya & Co., Ltd., 1903. *Presented by Dr. B. Kotô.*

This map is printed in colours, the hills being shown in brown shading, lowlying land lined in green, and water blue. It shows no details, and comparatively few names. The spelling of the names is according to the system of Dr. Kotô, the author, a professor of Tokyo University.

AFRICA.

Liberia. **de Morny and Okie.**

Map of the St. Paul River and vicinity, Montserrado County, Liberia. Made from a Prismatic Survey and Notes of the expedition of M. le duc de Morny and Howard Okie, Esq., 1902-3. Scale 1 : 633,600 or 10 stat. miles to an inch. *Presented by Howard Okie, Esq.*

The route here shown extends from Monrovia, on the coast, for about 250 miles into the interior, and follows approximately the course of the St. Paul river. The map extends for a considerable distance further to the north, but this part is merely roughly sketched in. No latitudes or longitudes are given, and the map can only be considered as a preliminary compass sketch, without any attempt at great accuracy. However, as little survey work of any kind has been done in Liberia, any addition to our knowledge of the country is important.

AMERICA.

Brazil. **Jerrmann.**

Das Quellgebiet des Rio Paraguay. Von Kapitän Ludwig Jerrmann. Scale 1 : 400,000 or 6·3 stat. miles to an inch. *Petermanns Geographische Mitteilungen,* Jahrgang 1903, Tafel 13. Gotha: Justus Perthes. *Presented by the Publisher.*

Canada. **Surveyor-General of Canada.**

Sectional Map of Canada. Scale 1 : 190,080 or 3 stat. miles to an inch. Wood Mountain Sheet (49), West of Third Meridian. Revised to June 1, 1903. Tramping Lake Sheet (61), West of Third Meridian. Revised to May 19, 1903. Edmonton Sheet (79), West of Fourth Meridian. Revised to June 9, 1903. Ottawa: Surveyor-General's Office, 1903. *Presented by the Surveyor-General of Canada.*

Mississippi River. **Mississippi River Commission.**

Survey of the Mississippi River, made under the direction of the Mississippi River Commission. Lake Itasca Basin within Itasca State Park. Projected from a trigonometrical survey made in 1900. Scale 1 : 15,000 or 4·2 inches to a mile. St. Louis, [1903]. *Presented by W. G. Comber, Esq.*

The triangulation, levels, topographical, and hydrographical work upon which this map is based were carried out under the direction of Captain Mason M. Patrick, Corps of Engineers, U.S.A., and Captain G. P. Howell, Corps of Engineers, U.S.A., secretaries of the Mississippi River Commission. Latitudes and longitudes are derived geodetically from the Cairo Astronomical station, determined in 1876 by Captain H. M. Adams, Corps of Engineers, U.S.A., and First Lieut. D. W. Lockwood, Corps of Engineers, U.S.A. Elevations are given in feet above the Memphis datum plane, and the contour-lines, in brown, are 5 feet apart. The soundings in the lake were measured at low water, the rise and fall of the lake being about 1·3 foot. The map is specially interesting from the fact that it includes the headwaters of the Mississippi.

North America. **McGee.**

Karte der Fall-Linie des östlichen Nord-Amerika nach W J McGee. Scale 1 : 5,702,400 or 90 stat. miles to an inch. With sections. *Vierteljahrshefte für* *den geographischen Unterricht*, II. Jahrgang, Heft 3. Vienna: Ed. Hölzel, 1903. *Presented by the Publisher.*

United States. **Blum.**

Kärtchen der Vereinigten Staaten. Von Richard Blum. Scale 1 : 12,500,000 or 197·2 stat. miles to an inch, and 1 : 30,000,000 or 473·4 stat. miles to an inch. *Petermanns Geographische Mitteilungen Ergänzungsheft*, No. 142. Gotha: Justus Perthes. *Presented by the Publisher.*

AUSTRALASIA.

Australasia. **Robinson.**

Australasia. Scale 1 : 5,702,400 or 81 stat. miles to an inch. By H. E. C. Robinson. Sydney: H. E. C. Robinson. *Presented by the Publisher.*

A somewhat roughly executed wall-map of Australasia, in two sheets. In places the hill-work is confused, and the names obscured by hill-shading. Political divisions are clearly indicated by colours.

Queensland. **Dunstan and Fox.**

Geological Sketch-map of Queensland. Prepared under the supervision of B. Dunstan, F.G.S., Acting Government Geologist, and compiled by H. W. Fox at the Geological Survey Office, Brisbane. Scale 1 : 1,267,200 or 20 stat. miles to an inch. Brisbane: Geological Survey Office, 1902. *Presented by the Geological Survey of Queensland.*

This map has been compiled from surveys and reports by Messrs. Clarke, Stutchbury, Aplin, Daintree, Gregory, Jack, Rands, Maitland, Skertchly, Dunstan, and others. It contains a clear explanation of the colours employed to denote the various formations, and other tabular matter.

POLAR REGIONS.

Polar Regions. **Isachsen.**

Die Wanderungen der östlichen Eskimo. Von Gunnar Isachsen. Scale 1 : 6,000,000 or 94·6 stat. miles to an inch. *Petermanns Geographische Mitteilungen*, Jahrgang 1903, Tafel 14. Gotha: Justus Perthes. *Presented by the Publisher.*

GENERAL.

Portuguese Colonies. **Ministerio da Marinha e Ultramar.**

Atlas Colonial Português. Edição reduzida. Ministerio da Marinha e Ultramar. Commissão de Cartographia, 1903.

A small general atlas of the Portuguese colonial possessions. It consists altogether of ten sheets of maps and plans which have been reduced from larger scale-maps by photo-lithography. The style of production is decidedly rough, and some of the maps are on too small a scale to be of much service.

CHARTS.

North Atlantic Ocean and Mediterranean Sea. **Meteorological Office.**

Pilot Chart of the North Atlantic and Mediterranean for August, 1903. London: Meteorological Office. *Price 6d. Presented by the Meteorological Office, London.*

United States Chart. **United States Hydrographic Office.**

Pilot Chart of the North Atlantic Ocean for July, 1903, and of the North Pacific Ocean for August, 1903. U.S. Hydrographic Office, Washington, D.C. *Presented by the U.S. Hydrographic Office.*

PHOTOGRAPHS.

Ceylon. **Sternberg.**

One hundred and sixty-two Photographs of Ceylon, taken by F. Sternberg, Esq. *Presented by F. Sternberg, Esq.*

An interesting little set of photographs, of which the following are the titles:—

(1) A street in Colombo; (2) Museum, Colombo; (3) The lake and washing-place, Colombo; (4) Schoolboys, Colombo; (5) Cingalese, Colombo; (6) A crow, Colombo; (7) General Post Office, Colombo; (8) A chetty, Colombo; (9) A banyan tree, Colombo; (10) Hindu temple, Colombo; (11) Cocoa-nuts and natives; (12) Dutch wall and gate, Negombo; (13) Dutch canal, Negombo; (14 and 15) Fishing-boats, Negombo; (16) Fisherman's huts under palm trees, Negombo; (17) Boys playing cricket, Negombo; (18) Bull, showing brands, Negombo; (19) Kandy, from the Upper Lake walk; (20) Kandy lake and island, from the Upper Lake walk; (21) Ward street, Kandy; (22) Temple of the Tooth, Kandy; (23-25) Lady Horton's walk, Kandy; (26) The pavilion, Governor's residence, Kandy; (27) The reservoir, Kandy; (28) A Cingalese, back

view; (29) A Cingalese, front view; (30) A fruit-seller, Kandy; (31) Buddhist priests, Kandy; (32) Bo tree; (33) "We've been playing rounders;" (34) Bathing-place, Kandy; (35) Public washing-place, Kandy, (36) The road to the river, Kandy; (37) Ferry on the Mahavelli Ganga; (38) Elephants having their bath; (39) "It's so refreshing;" (40) Avenue of Talipot palms; (41) Satinwood bridge; (42) Alu Wihari, Rock Temple, Matale; (43) Frescoes on Rock Temple; (44) Outside the court house, Matale; (45) A headman's wedding party; (46) Group of natives, Matale; (47) Fortune teller, Matale; (48) The coach to Anuradhapura; (49) Village on the road to Anuradhapura; (50) Waiting on the road for the coach to Anuradhapura; (51) Native carrying fowls; (52) Carolina tea estate; (53) The bungalow, Carolina; (54) The Boer camp, Diyatalawa; (55) Last remaining Boer prisoners of war; (56) Boer cemetery; (57) Policeman and sergeant, Bandarawella; (58) The sign-post, Bandarawella; (59) A bungalow near Bandarawella; (60) Interior of verandah of a bungalow; (61) A tea-field, coolies picking; (62) A Canganny; (63) A tea-picker; (64) Coolies returning from picking tea; (65) Weighing up the tea; (66) Some of the workers in the tea factory; (67) Withering tea; (68) An open-air crêche on a tea estate; (69) The Hill Club, Nuivera Eliya; (70) The golf links, Nuivera Eliya; (71) Golf caddies, Nuivera Eliya; (72) The lake, Nuivera Eliya; (73 and 74) Tree ferns in the Hallgalla botanical gardens; (75) Scene in the Hallgalla botanical gardens; (76) Udapusselawa; (77) Fountain and rest-house, Badulla; (78) The square, Badulla; (79) The cross-roads, Badulla; (80) "Buddhism embracing Christianity:" Bo tree which has grown round Mrs. Wilson's tomb, Badulla; (81) Mrs. Wilson's tomb; (82) The post office and staff, Badulla; (83) The hospital, Badulla; (84) The market, Badulla; (85) The town hall, Badulla; (86) Obelisk with Sanscript inscription and ancient sluice; (87) Government buildings, Badulla; (88) A portion of the square, Badulla; (89) A police proclamation; (90) Group of pupils of the Buddhist-English school, Badulla; (91) An Afghan; (92) Tamil woman showing distended lobe of ear; (93) Cingalese, with hackory and coolie carrying box; (94) A pretty landscape; (95) The ingredients used in betel nut, chewing chalk made of shells, tobacco, areca nut, and betel leaves; (96) Coach in which Mr. Sternberg drove from Bandarawella to Ratuapura; (97) A toll-keeper with badge of office; (98) Haldamulla rest-house; (99) Bilihuloya rest-house and large tree; (100) Rural postmen; (101) Paddy field-worker with native-made hoe; (102) Watcher's hut in paddy field; (103) Ploughing paddy field with buffaloes; (104) Ganegama Buddhist temple, near Pelinadulla; (105) Kandyan chief's tomb; (106) A Cingalese woman from the low country; (107) Rest-house, Ratuapura; (108) Principal street, Ratuapura; (109) Government dispensary, Ratuapura; (110) Shelter for natives; (111) A group of natives; (112) Tamil barber shaving Moorman's head; (113) The smithy, Ratuapura; (114) Iak tree, Ratuapura; (115) A Cingalese girl; (116) Mr. Sternberg and his bullock-cart; (117) Gem pit; (118) Gem-diggers; (119) Cutting and polishing gems; (120) A woman worker in paddy field; (121) Ferry on Kalu Ganga; (122) View of river Kalu Ganga; (123) Crew and boat in which Mr. Sternberg went down the Kalu Ganga river from Ratuapura to Kalutura; (124 and 125) Boats on river Kalu Ganga; (126) Kalu Ganga river at Kalutura; (127) A street in Kalutura; (128) Racecourse and cricket ground, Galle; (129) Clock tower on the ramparts, Galle; (130) Dutch gateway and arms, Galle; (131) Old Dutch church, Galle; (132) Interior of old Dutch church; (133) Principal street in native town, Galle; (134) Moormen boys; (135) Lighthouse, Galle; (136) Fishing-boats; (137) A bit of the coast, Galle; (138) Fishermen; (139) A brick-and-tile kiln; (140) Fishermen with nets, Galle; (141) "The oldest inhabitant:" this tortoise belonged to a Dutch governor, and is supposed to be 140 years old; (142) Mr. Sternberg's conveyance, guide, and servant, Anuradhapura; (143) Ruanwelli Dagoba; (144) Frescoes on the Ruanwelli Dagoba; (145) Figure of King Dutugemuna, builder of Ruanwelli Dagoba; (146) Ietewanrama Dagoba; (147) Large figure of Buddha; (148) Ancient Hindu goddess; (149) Yogi stone; (150) Thuparama Dagoba; (151) Entrance to queen's palace; (152) Carved moonstone and steps; (153) Bath; (154) Isurumuniya Rock Temple; (155) Buddhist priest with key of temple; (156) Post office, Anuradhapura; (157) Tamil woman and daughters; (158) Cingalese woman dressed as Tamils; (159) Women pounding rice; (160) Tamil children; (161) Stone railing: (162) Steps at Mahintale.

India. **Knowles.**

One hundred and twenty-two Photographs of the North-West Frontier of India, taken by G. J. F. Knowles, Esq. *Presented by G. J. F. Knowles, Esq.*

A set of small platinotypes of views in the neighbourhood of the Baltoro glacier, Skardu, Askole, and Srinagar. As will be seen by the titles, the subjects vary considerably, some being of native villages and their inhabitants, whilst the greater number are of mountain scenery.

(1) The Indus at Skardu; (2) Corner of fort near Skardu; (3) Shigar valley; (4) Shigar valley at Alchori; (5) Rajah and suite at Shigar; (6) Village of Shigar;

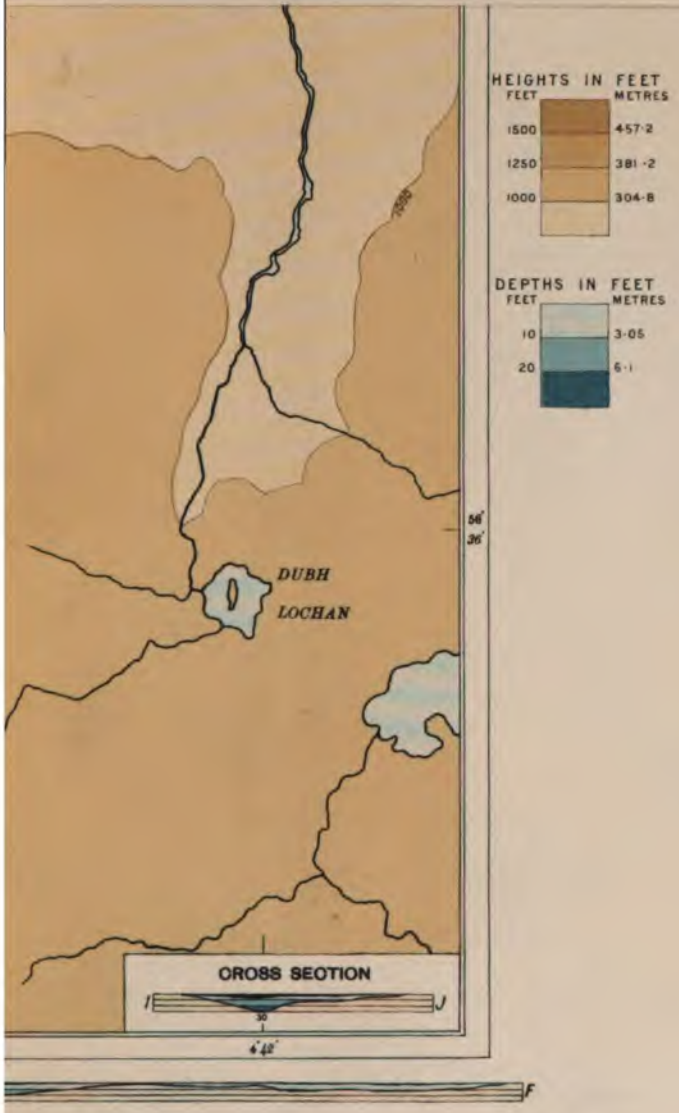
(7) Doctor operating on native at Tolti; (8) Entrance of Bralduh valley; (9) Log bridge, Ghomboro, Bralduh valley; (10) Pakorah rope-bridge, Bralduh valley; (11) Second rope-bridge, Bralduh valley; (12) Hot sulphur spring, near Askole; (13) Rope-bridge at Askole; (14) At Askole; (15) At Askole, Mango Gusor in the distance; (16) Mango Gusor, from Askole; (17) Coolies leaving Askole; (18) Approaching Biafo glacier; (19) Side of Biafo glacier; (20) Camp at Paigu; (21) Fording Punma torrent; (22) Provision house built at Paigu; (23) Crags near Bardumal; (24) View south from Paigu; (25) Near Baltoro snout; (26) Snout of Baltoro glacier; (27) View of surface of Baltoro glacier; (28) Camp 1 on glacier Liligua; (29) Looking across Baltoro glacier from near Liligua; (30) Looking west-north-west from Khobutse; (31) Khobutse Lunguia; (32) View from Khobutse; (33) View from near Khobutse; (34) Trongo Brawsa glacier; (35) View taken from a point between Liligua and Khobutse; (36) Castle peak, north-west of Khobutse; (37) View looking across Baltoro glacier from Khobutse; (38) Second tributary on left bank of Baltoro; (39) View from near Rdokass; (40) Looking east-north-east from Rdokass; (41) Distant view of Gusherbrum from near Rdokass; (42) Rdokass; (43) Avalanche *débris* and nullah near Rdokass; (44) The cave near Lhungka; (45) Looking south-east from Lhungka; (46) Mundu glacier; (47) Masherbrum from between camps 4 and 5; (48) Masherbrum from Lhungka; (49) Masherbrum from near Lhungka; (50) The Mustagh tower; (51) Mustagh tower and Younghusband glacier; (52) Gusherbrum from between camps 6 and 7; (53) Golden Throne from Doksau; (54) Mitre, from camp 7; (55) Mitre from near camp 7; (56) Mitre from junction; (57) Peak next to Mitre on west, from camp 7; (58) Golden Throne from near camp 7; (59) Gusherbrum from junction; (60) Mitre from near camp 8; (61) Mitre from Godwin-Austen glacier; (62) Entrance to first right-hand tributary of the Godwin-Austen glacier; (63) South bank of first right-hand tributary of the Godwin-Austen glacier; (64) North bank of first right-hand tributary of the Godwin-Austen glacier; (65) Mitre from near Sunchon; (66) Chogo-Ri from near camp 8; (67) Broad peak from near camp 8; (68) Chogo-Ri from Godwin-Austen glacier; (69) Looking south down Godwin-Austen glacier; (70) Chogo-Ri from camp 8; (71) Chogo-Ri from between camps 8 and 9; (72) Seraes at junction of Godwin-Austin glacier with its eastern branch; (73) Looking up east branch of Godwin-Austen glacier; (74) Coolies approaching camp 9; (75) Looking south down Godwin-Austen glacier, Bride peak in distance; (76) Snout of glacier hanging on Chogo-Ri close to camp 9; (77, 78, and 80) Camp 10, 18,500 feet; (79) Arrival of coolies at camp 10; (81) Broad peak from camp 10; (82) Looking down east branch of Godwin-Austen from camp 10; (83) An avalanche falling down slopes of Chego-Ri; (84) The same avalanche as in photograph 83, crossing the glacier; (85) Looking down glacier from camp 10; (86) Looking south-east from camp 10; (87) Looking down glacier from between camps 10 and 11; (88) Camp 11, 20,000 feet; (89) Chogo-Ri from east side; (90) The pass, about 21,000 feet, Chogo-Ri; (91) On ski near camp 11; (92) Staircase peak, near camp 11; (93) East ridge of Chogo-Ri and Staircase peak; (94) Looking south-east from camp 11; (95) Staircase peak from camp 11; (96) Last view of Baltoro glacier; (97) Coolies coming up Skoro glacier; (98) Skoro-ta pass; (99) Peak seen from summit of Skoro-ta; (100) Crags at summit of Skoro-ta; (101 and 102) Raft on Shigar river; (103) The Deosai plains; (104) Ford on the Deosai plains; (105) Looking down valley from Burzil; (106) Burzil bungalow on the Gilgit road; (107) The Jhelum river above Srinagar; (108, 109, 113, and 120) Srinagar; (110) Skardo; (111) A native house-boat on the Jhelum river below Srinagar; (112) Near Askole; (113) The Mohammedan mosque and Hari Parbat, Srinagar; (114) The big mosque, Srinagar; (115) The fourth bridge over the Jhelum at Srinagar; (116) A village near Srinagar; (117) The Chenar Bagh, Srinagar; (118) The Kashmir road; (119) The Jhelum river at Srinagar, Takht-i-Suleiman in background; (120) In Srinagar, near Chenar Bagh; (121) A ruined temple near Srinagar; (122) Bramullah.

Mt. Kilimanjaro. **Johannis.**

Two Photographs of the Kibo Crater, Kilimanjaro taken by Captain Johannis. *Presented by A. F. Wilcken, Esq.*

These two photographs were taken by Captain Johannis, the acting governor at Dar-et-Salaam, during a visit to Mount Kilimanjaro last year. They show the interior of the crater of Kibo, one of the left side, and the other of the right.

N.B.—It would greatly add to the value of the collection of Photographs which has been established in the Map Room, if all the Fellows of the Society who have taken photographs during their travels, would forward copies of them to the Map Curator, by whom they will be acknowledged. Should the donor have purchased the photographs, it will be useful for reference if the name of the photographer and his address are given.



J. G. Bartholomew

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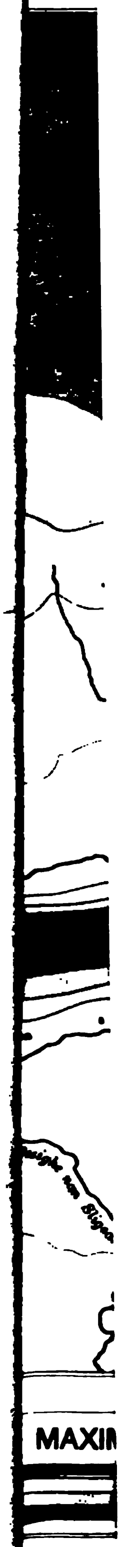

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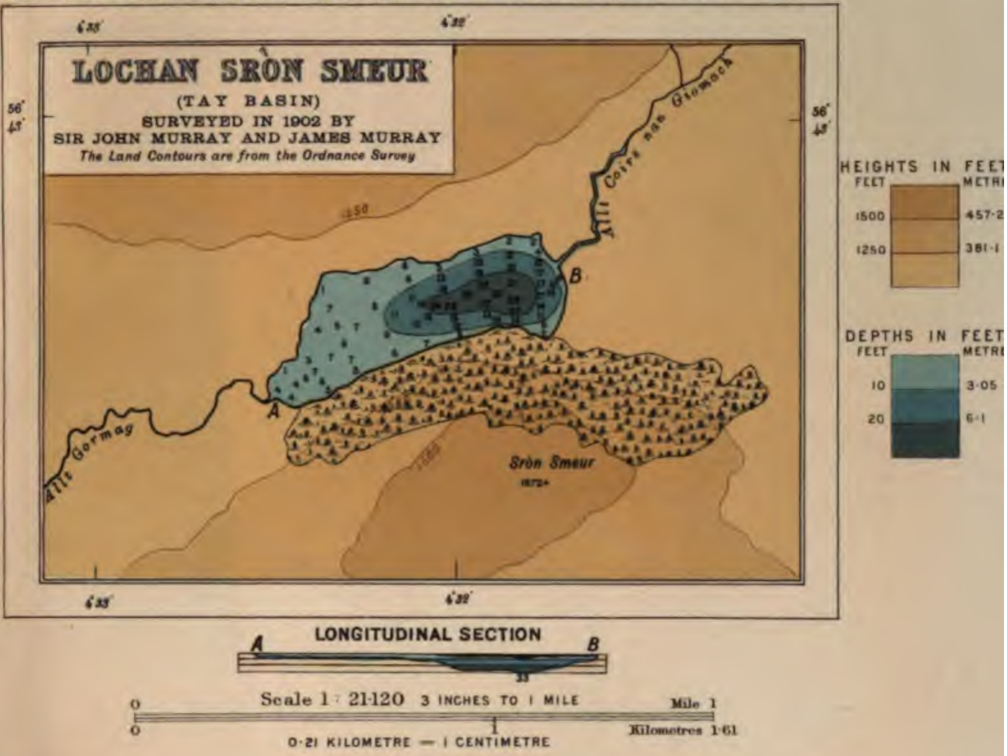
Society.

BATHYMETRICAL SURVEY OF THE LOCHS OF SCOTLAND

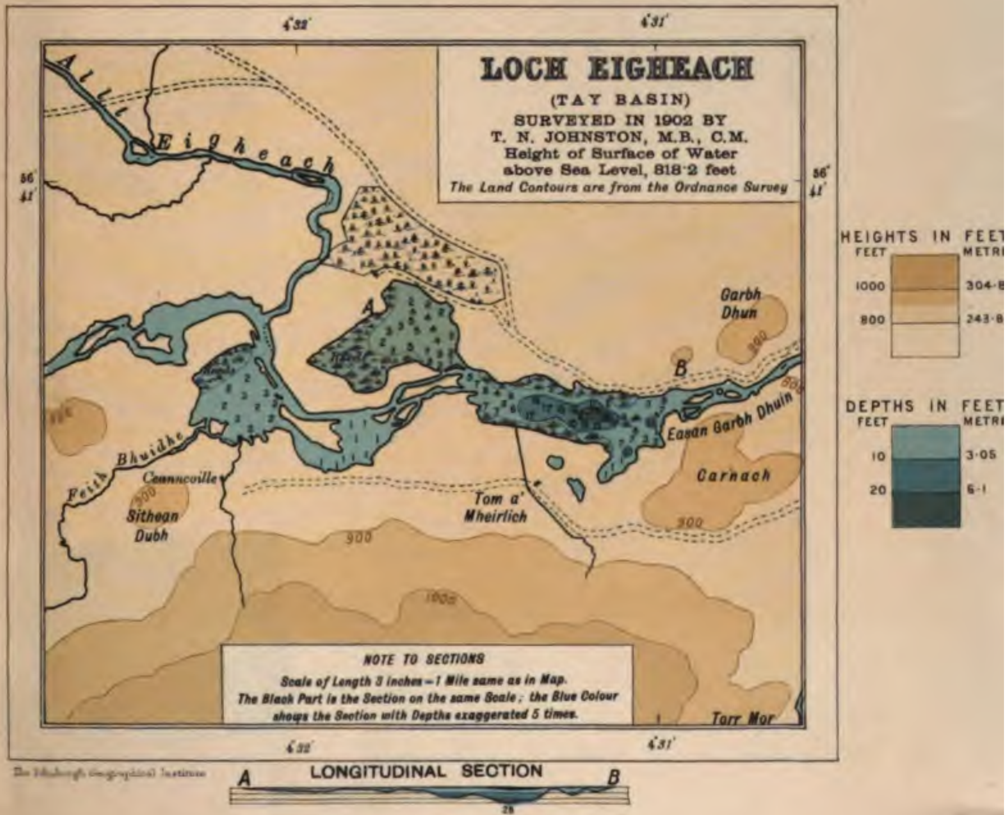
UNDER THE DIRECTION OF

SIR JOHN MURRAY, K.C.B., F.R.S., D.Sc., AND LAURENCE PULLAR, Esq., F.R.S.E.



LOCHAN SRON SMEUR

(TAY BASIN)
SURVEYED IN 1902 BY
SIR JOHN MURRAY AND JAMES MURRAY
The Land Contours are from the Ordnance Survey



LOCH EIGHEACH

(TAY BASIN)
SURVEYED IN 1902 BY
T. N. JOHNSTON, M.B., C.M.
Height of Surface of Water
above Sea Level, 818·2 feet
The Land Contours are from the Ordnance Survey

NOTE TO SECTIONS

Scale of Length 3 inches = 1 Mile same as in Map.
The Black Part is the Section on the same Scale; the Blue Colour shows the Section with Depths exaggerated 5 times.

The Edinburgh Geographical Institute

Published by the Royal Geographical Society

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PLATE V

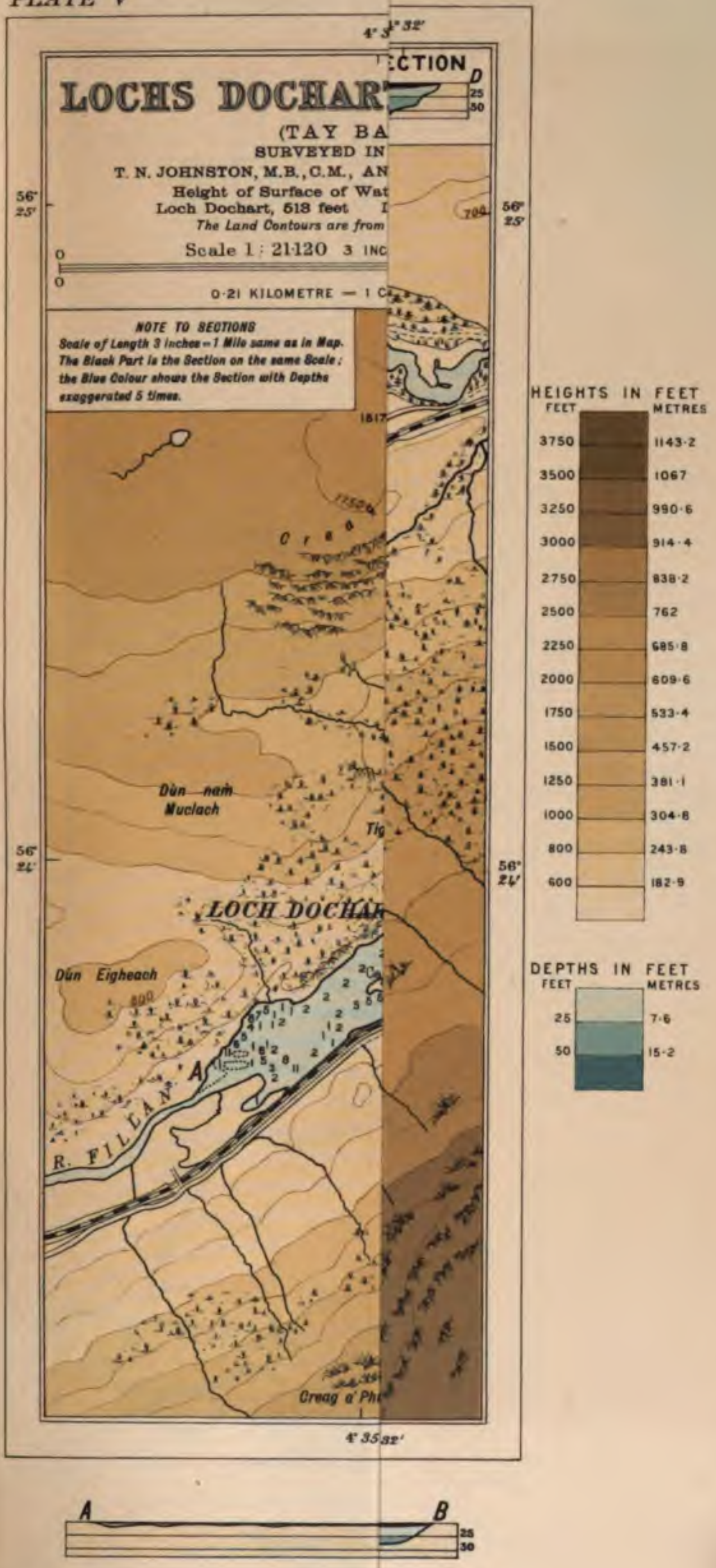

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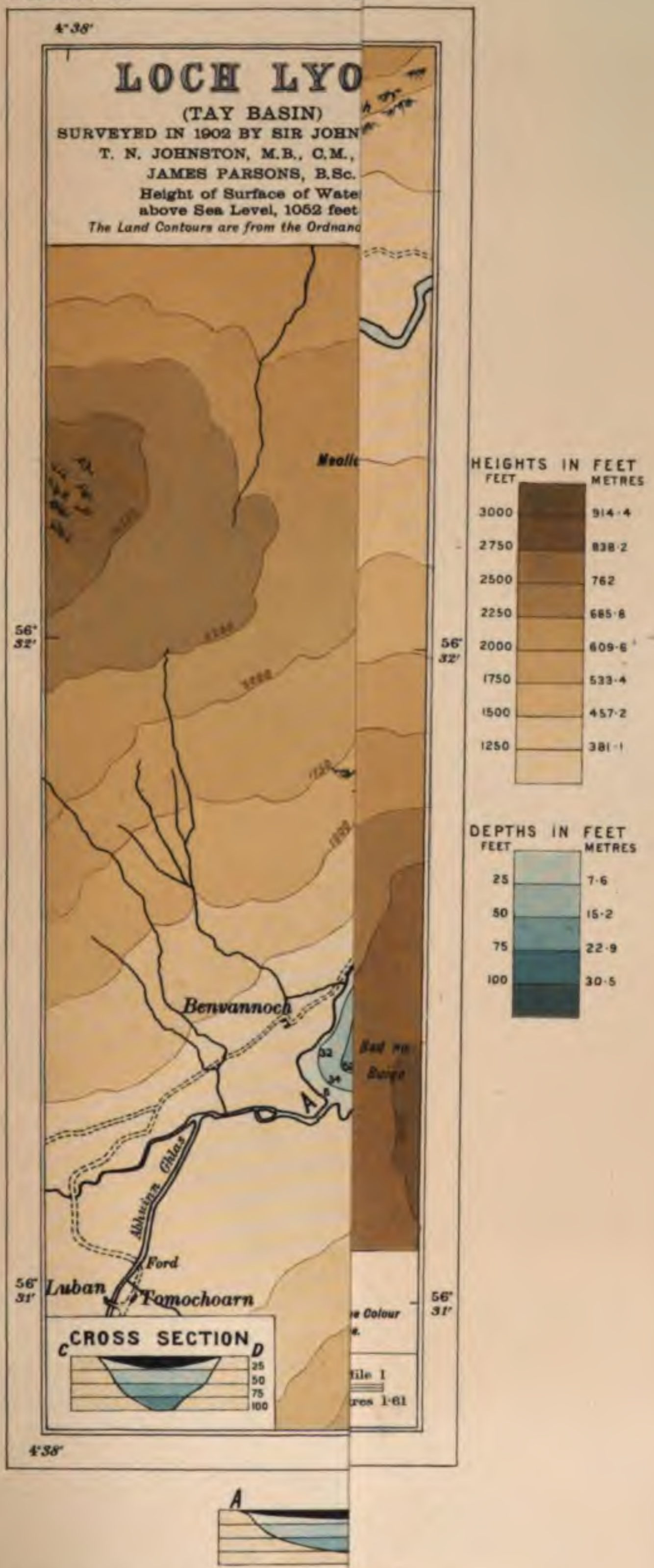
PLATE VI

S



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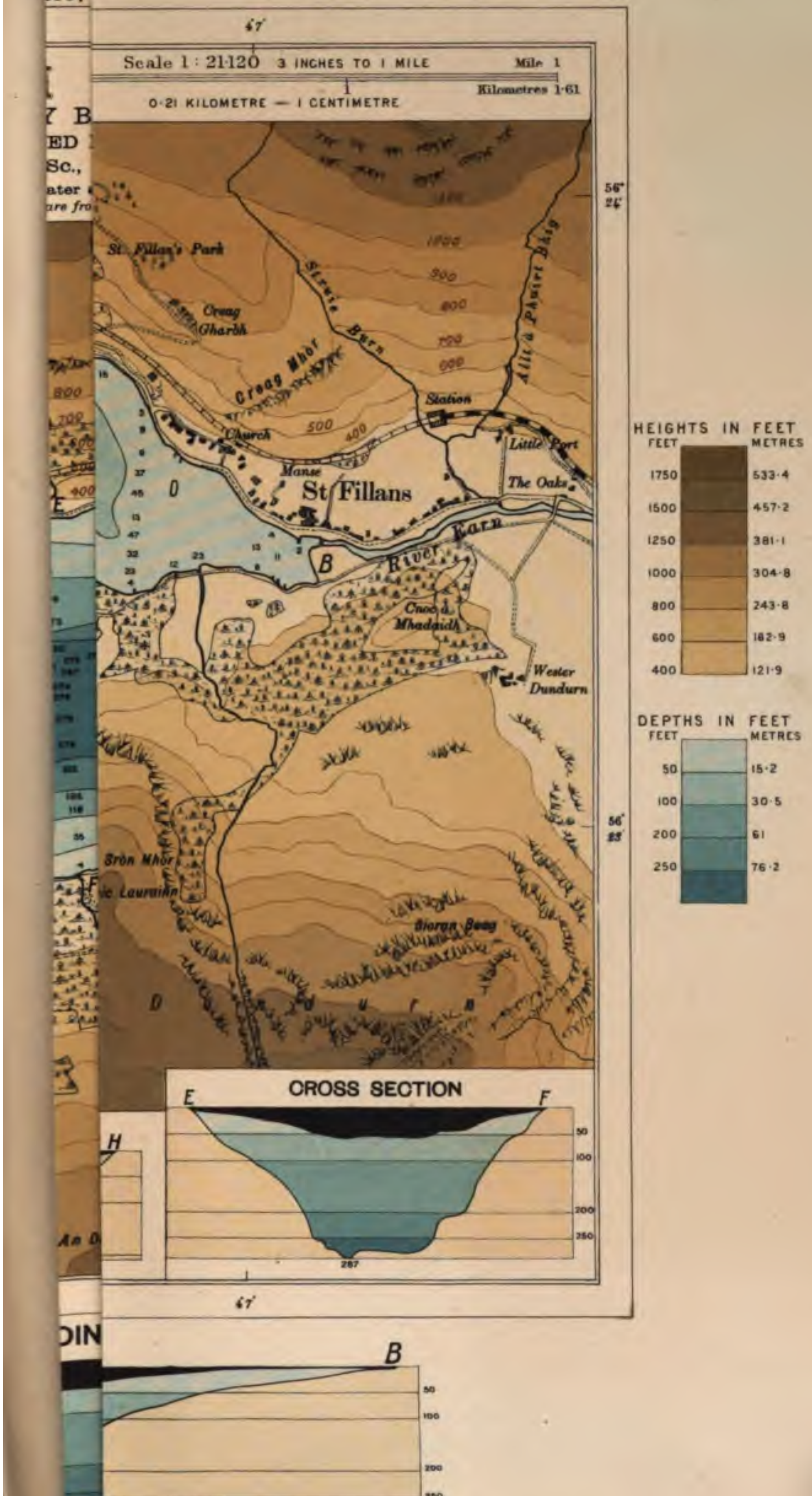

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The

Geographical Journal.

No. 4. OCTOBER, 1903. Vol. XXII.

CILICIA, TARSUS, AND THE GREAT TAURUS PASS.

By Prof. W. M. RAMSAY.*

I. Cilicia.

Bearing in mind that Asia Minor consists of a lofty quadrilateral plateau closed in by a rim of mountains, which are edged with a fringe of low coast-land and sea-valleys or glens extending up into fissures in the mountain-rim, we may roughly describe Cilicia as being that part of the fringe which lies in the extreme south-eastern corner, between the sea on the south and the mountain-rim (called Taurus) on the north. As to its other boundaries, Cilicia on the west is hemmed in by the mountain-rim, which broadens out till it touches the sea, and on the east it is shut in by a single ridge protruding to the south from the Taurus, and named Amanus. Thus Cilicia is marked off, as with a giant's hand, by bold and lofty mountain ranges, and it lies far down under them, beside the sea, well-watered, fertile, and requiring, for the most part, only the minimum of work and forethought to maintain that proper balance between water and soil which in those countries is the prime condition, and which can rarely be attained in them except with great care and elaborate preparation. The maintenance of the balance requires both that the waters which flow down from the surrounding mountains should not be allowed to form marshes in some places, and that their fertilizing influence should not be denied to other parts. At the present time long neglect has permitted some portions of Cilicia to become useless from one or other of those two causes; but still, considerable part is productive in the highest degree, with little attention to irrigation.

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In addition to the sea-plain, Cilicia contains a tract of higher land, viz. the foothills which are interposed to break the transition between the lofty Taurus mountains and the coast, and also a part of the Taurus ridge itself. But these hills and slopes have had no independent character in history; they were simply adjuncts to the fertile coast-plain, enabling the population of the latter to maintain health and vigour in themselves and in some classes of their domestic animals by utilizing the differences of level and of temperature.

This land, called the Level Cilicia by the ancients, is remarkably homogeneous, both geographically and historically. It is separated from the rest of the world by very commanding boundaries, and within it there is no emphatic division to mar its unity. Generally speaking, it fell before an invader as a whole or it successfully resisted as a whole.

But no country is absolutely homogeneous geographically; and where there is any free national life, some divergence of feeling and interest must arise between the parts and introduce the element of competition and rivalry. Only where there is a dead level of stagnation, as in modern Turkey, can there be perfect homogeneousness in the people and the cities and the history of any district. The principle which is emphatically expressed in the Cilician country is that the historical differences are obviously founded on the geographical divisions.

Even a slight examination of the map shows that the Level Cilicia is divided into two plains, the Lower and the Upper. The Lower or Western Plain is triangular in shape, with the sea at its base, and its apex in a recess of the foothills. Along with it must be included (1) the slopes that lead back to the northern limits on the broad back of Taurus, and (2) a very narrow strip of coast on the west, where the plateau mountain-rim and the intermediate lower hills come closer and closer to the sea. The Western Plain is watered and drained by three rivers, Cydnus, Saros, and Pyramus; and many minor streams flow from the edge of Taurus through the foothills to join these rivers, or, at the western end of Cilicia, to fall direct into the sea.

The Upper or Eastern Plain lies higher up on the Pyramus and its tributaries. It is divided both from the sea and from the Western Plain by a ridge called Jebel-Nur,* which protrudes from Amanus westwards along the coast, and at one point approaches so close to the northern foothills as to form a narrow pass. Through this pass the river Pyramus finds its way from the Upper to the Lower Plain, and where it enters the Lower Plain there stands in the gateway an ancient city, now Missis, formerly Mopsou-Hestia,† commanding the crossing of the Pyramus.

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* The south-western end is called Dede-Dagh.

† "The Hearth of the prophet Mopsus."

This position determines its tragic history. Its position was strong, and yet not strong enough. The hills could readily be crossed, and the city could thus always be surrounded by an invading force. It lay on the track of every army. It was captured by every even temporarily successful invader, and usually destroyed by each of them; yet its position was so important at the great crossing of the Pyramus that it must continually be restored, only to perish once more in the next invasion during the pitiable period of Cilician history between 650 and 1615.

Along with the Eastern Plain must be reckoned the slopes that lead up to Taurus and to Amanus, as well as the whole Jebel-Nur and its strip of coast-land.

Under the Roman Empire Cilicia was at first a mere adjunct to Syria, and afterwards a province along with the countries on the west and north-west. But as growing civilization produced more complex organization, Cilicia, in the early fourth century, became a separate province, and finally, about 397, was divided into two distinct provinces, First and Second Cilicia, which correspond exactly to the two geographical parts above described. Failure to observe the geographical character of this division has led the recent Austrian explorers, Messrs. Heberdey and Wilhelm, into error, for they place the city of Augusta, which belonged to First or Western Cilicia, in the extreme east of Second Cilicia,* *i.e.* the Eastern Plain.

But even before the formal separation, the difference between the two plains made itself apparent in history. One was a maritime plain and in closer relation with foreign countries; it was the larger, and was the seat of a civilization of earlier and more Europeanized development. The other was an inland plain (except the strip of coast on the south of Jebel-Nur), for a long time more Oriental in character. The contrast between the two plains was expressed in the rivalry between their two capitals, Tarsus in the Western Plain, and Anazarbus in the Eastern, and the story of that rivalry would fill a curious page in history. So long as any true municipal life exists, such rivalry is inevitable and not necessarily unhealthy; it ceases only in a dead-level of apathetic and characterless monotony.

II. Rivers and Cities of the West Cilician Plain.

But even the Western Maritime Plain has not a homogeneous history strung on a single thread or connected with the fortune of a single leading city. It contains three great rivers, and each of these has for a time supported the chief city of the whole plain, the centre of distribution and trade. The cities—Adana on the Saros, Mallos on the

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* See their *Reisen in Kilikien*, p. 2. M. Imhoof Blumer also placed it in that neighbourhood. The determining condition for Augusta was pointed out in the *Historical Geogr. of Asia Minor*, p. 384.

Pyramus, and Tarsus on the Cydnus—reflect the part which the rivers have played in making and moulding the country and its history.

Each of the three rivers in succession has offered for a time the chief channel or harbour for such maritime trade as existed, and thus given the pre-eminence to its own city. The Saros and the Pyramus both carry a much larger body of water than the Cydnus, afford direct communication with much larger territories, and flow near the central axis of the country. Yet in past history Tarsus and the Cydnus have played a much greater part than Mallos or Adana with their respective rivers. The story of the manner in which the rivers have, first of all, made the country, and afterwards moulded the history of man in the country, has never been written. I am not competent to describe it fully; but even the part which I seem to see with clearness and certainty would require a large chapter to itself, and in this paper it is only possible to indicate what is needed for understanding rightly the nature and importance of our main subject.

Here, on a comparatively small scale and within rather narrow limits, the influence of natural conditions, and particularly of rivers, on human development is expressed in such broad and emphatic outlines that it can be studied with unusual clearness. And if the scale is small in comparison with the great modern countries, it is large in comparison with ancient Greece; that feeling of tininess, as of a toy-country with children playing at history, which has been the first impression on the mind of many travellers as they looked over the little plains of Argos and Mycenæ, or of Athens, or of Olympia, has no place in the mind of a traveller in Cilicia. On the contrary, as one stands on the top of the highest house on the acropolis of Adana, and looks north across the low intervening hills to the summits of Taurus, and south over the apparently limitless plain which the ancients called the Aleïan, the sense of greatness and wide extent is quite out of proportion to the actual measurements, for that apparently limitless plain between Adana and the sea contains only 800 square miles* of arable land, with a strip of sand-hills and lagoons along the coast.

There was a time when the level West Plain of Cilicia was a great arm of the sea. That gulf has been gradually filled up by the two great rivers, Pyramus and Saros (aided probably by a slight rise in the level of the land †), and of these the Saros has been the chief agent in determining the character of the plain.

The Pyramus keeps close to the bounding hills of Jebel-Nur on the east, creeping round their outer edge. It flowed into the sea, during the Greek and the Roman period, on the west side of the little isolated ridge of hills on which Mallos was situated. Afterwards, during the middle ages, it changed its course, and now it hugs still more closely the edge of Jebel-Nur, creeping round until its mouth flows back to the east into the bay of Ayash, which it is rapidly filling up. Thus it now flows on the east side of the Mallos hills. Throughout history its agency has been confined to the extreme eastern edge of the Lower Plain of Cilicia.

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* The estimate is taken from Major Bennet.

† Dr. Christie, of Tarsus, told me that a succession of old sea-beaches can be traced, marking out the shape of the former gulf.

Mallos occupied a position of peculiar importance in early time. It was safe and strong from its situation on a hill. It was close to the sea, but it faced, not towards the sea, but the river (as Scylax says); * and it had at Magarsus the mouth of the river to serve as its harbour. From its coinage we see that it was the old port-city of Cilicia, the earliest seat of Greek influence and trade, and the chief centre of distribution for the plain.† But its greatness lies far back at the very beginning, and even before the beginning, of recorded history. At that time the Pyramus was, as I believe, the only well-defined river-entrance on the Cilician coast, and the first river produced the first city.

The key to early Cilician history lies in the development, *i.e.* the gradual defining, of the river Saros. This river has been a great problem to modern geographers, such as Prof. Carl Ritter in his monumental 'Erdkunde von Asien.' Why is it that some of the old Greek writers speak of the Saros as flowing into the sea, while others omit it as if it never reached the sea by an independent mouth? A fantastic theory has been devised by Langlois, and mentioned with toleration though not definitely accepted by Ritter, to the effect that the Saros channel varied to an extraordinary degree; that it sometimes joined the Pyramus, and other times had an independent mouth, and again resumed its connection with the Pyramus; and that this change back and forwards has occurred many times.

I do not dispute the fact that the Saros may at an early time have joined the Pyramus. Sir Charles Wilson's opinion is that it did so, and that the channel can be traced; and we may safely follow his opinion on such a matter.‡ That is not the point which here concerns us.

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* Dr. Heberdey follows M. Imhoof Blumer in placing Mallos 15 miles up the river, in a marsh where the old and the modern arms fork; they disregard Strabo's express statement that it was situated on a height, and his implication (shown in his following paragraph) that it was a coast city. The number of stadia given in the Stadiasmus between Mallos and Antiocheia-Magarsus cannot be trusted; that authority is full of such errors. The actual site of Mallos has not yet been discovered: it will be found probably on the northern slope of the ridge of hills not far from the village of Kara-Tash.

† The great Swiss numismatist, M. Imhoof Blumer, has given back to Mallos its early coinage (formerly wrongly assigned), and thus made it possible to restore a lost page in history, which here we can only allude to in passing.

‡ I ought, however, to mention that Colonel Massy says the levels are unfavourable to this opinion.

The point is that the Saros, from at least the first century B.C. onwards, has had its separate independent course from Adana to the sea, and has not, during that period of two thousand years, been connected with the Pyramus.

Now we can go back to a very early time, when the lower course of the Saros was a succession of swamps and waste land, and the Alêian plain through which it flows was only half won from the sea. Below Adana the river Saros has a very slight fall to the sea. The railway at Adana is only 19 metres (63 feet) above sea-level; but the course of the river from Adana to the sea is quite 35 miles, measuring roughly along the general line of its channel, and probably about 50 or 60, if its complicated windings are taken into account. Thus long after the Pyramus had a well-defined channel down to the coast near Mallos, the river Saros was struggling through those marshy lowlands to reach the sea

A memory of that early time is preserved in the Homeric poems, in the legend of Bellerophon—

> "When at last, distracted in his mind,
> Forsook of Heaven, forsaking human kind,
> Wide o'er the Alêian Plain he chose to stray,
> A long, forlorn, uncomfortable way."
>
> 'Iliad,' V.

The writer evidently understood the plain to be a melancholy waste, untraversed by any path, uninhabited by man, a scar upon the smiling face of the land, where a melancholic madman might "wander alone, eating his own soul, avoiding the paths of men."

This description can by no possibility be applied to the plain, as it was certainly in the time of Strabo, and apparently also three centuries earlier under Alexander the Great, one of the richest and most populous and highly cultivated districts known to the ancients. But it applies rightly to the plain as it must have been at some earlier period. As usual, when we can compare the Homeric description with natural conditions which have been in a process of change, the poem takes us back to a very early stage in the process. It preserves a true tale of ancient days, brought to the Ægean harbours by the first Greek sailors who traded to the port of Mallos; and that story probably carries us back as far as the ninth century B.C., and opens before us a page in the gradual formation of the Cilician land and the Cilician river.* How far human work co-operated with nature in defining the river is a question on which proper exploration would doubtless throw light.†

Strabo, with his usual accuracy, mentions that the Alêian Plain did not reach down to the sea. The modern travellers explain this. There is a strip of sand and waste land and lagoons along the coast, 2 or 3 miles in width, which Sir Charles Wilson describes as consisting of "sand-hills about 10 feet high, cane-brakes, lagoons of fresh and salt water, and two permanent marshes." The true Aléian Plain lies inland from this waste shore.

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* I do not touch on the question whether the form in which the 'Iliad' gives the story shows any traces of alteration and lateness.

† It is, perhaps, connected with the question as to the unknown site of Augusta, founded A.D. 20.

Strabo gives a minute description of the Cilician coast-line. He was an admirably careful geographer, whose work (so far as his own land of Asia Minor is concerned) impresses one more and more with its thoroughness and trustworthiness as one knows the country better. He describes the Cydnus mouth, and then he passes on to the Pyramus mouth, leaving the Saros unnoticed. Yet he alludes several times to the upper course of the Saros and its greatest tributary the Karmalas,* and relates how a flood in the Karmalas injured certain lands in the neighbourhood of Mallos. This seems very strong evidence, both negative and positive, in favour of those who maintain that the Saros joined the Pyramus in Strabo's time. Could Strabo be called a good geographer if he omitted the mouth of that important river? Could the Karmalas flood injure those lands, if the river flowed many miles to the west of Mallos?

But Ptolemy's evidence is clear, shortly after Strabo's time, that the Saros did not join the Pyramus. To infer from Strabo's silence that the Saros had no independent course to the sea is false. The reason why he is silent about the mouth of the Saros is that it was altogether unimportant for his purpose; it supported no city on its lower course, and it offered no harbour for trade. Its sluggish current ended in a lagoon, with a bar of sand half dividing it from the sea, and not even the small ships of the ancients could enter it. It exercised no effect on commerce and on civilization, and therefore it lay outside of Strabo's subject. The *argumentum a silentio* not merely gave a false conclusion; it also missed the real conclusion which can be drawn from Strabo. When read aright, Strabo opens to us another page in the building up of the Cilician land by the Cilician rivers. The Saros had still no direct entrance into the sea in his time, but ended in a lagoon, as indicated in the accompanying map.†

Now, a glance at the course of the river below Adana shows that great flood coming down the Saros would overflow the country on the south-east, below the great bend of the river, but not the country on the west. These lands on the left bank were, beyond all doubt, part of the territory subject to the great city of Mallos, and the injury caused by such a flood would affect chiefly the people of Mallos. That sudden and transitory flood would do little harm in the upper and middle course of the river, but below Adana, where the stream meanders in its almost level channel, it would sweep headlong over the lands between its left bank and the sea.

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* Prof. Tomaschek still maintains the old error that the Karmalas was a tributary of the Pyramus (see *Hist. Geogr. of Asia Minor*, p. 288, on the point).

† This appears from the distances stated in the *Stadiasmus Maris Magni*, and suits both Ptolemy and Dion Chrys., xxxiv., well.

Thus it was not till long after the Alêian Plain had been deposited and brought under human care and cultivation, that the Saros acquired a definite and well-marked mouth towards the sea. In the Roman period it still flowed into the large lagoon beside the modern Merkez, less than 9 miles east of the Cydnus, and 15 miles west of the Pyramus, as the *Stadiasmus* says.

But the building up of the Lower Cilician plain, and the reason why that work necessarily ceased at the modern coast-line, so that there has been extremely little change in the Cilician coast-line since the time of Strabo (except in the bay of Ayash, which is protected from the current that sweeps and protects the open coast-line)—all that forms a separate chapter.

We now see why the Saros could not develop a maritime city before the time of Strabo. We have next to examine how the Cydnus developed a great trading city.

In that early time when Mallos was the great Cilician port, the river Cydnus flowed not into the sea direct, but into a lagoon or Rhegma, into which the sea broke over its bar of sand. Tarsus was not at that time a city with a harbour; and it could not be a centre of trade. In that early period the Greek city Mallos, the trading capital, is contrasted with Tarsus, the Oriental city. That lagoon has long ceased to be a lagoon; it is now an inland lake, supplied by fresh-water springs and by overflow from the Cydnus, which no longer flows into the lake, and reaches it only by occasional overflow. But the very name Rhegma shows that it was originally a lagoon, half barred from, half connected with, the sea.*

This change in the course of the Cydnus was due to human agency: it was the work of Justinian in the sixth century after Christ.† Before that time the Cydnus flowed into the Rhegma, and thence reached the sea. But already, in the time of Strabo, about A.D. 19, it was no longer a lagoon, but only a wider part of the river-channel, serving as harbour and arsenal of the city; and the river flowed on in a well-defined course with a full body of water into the sea.

The conclusion seems clear. Engineering operations had assisted nature and helped to define the lake and the lower course of the river, to regulate both, to embank them and border the lake with piers and dockyards.* The useless lagoon had been converted into an admirable harbour, perfectly open, yet completely land-locked. This great operation must be understood as a part of the improvements whereby Tarsus had ousted Mallos from its rank as the chief port-city of Cilicia. Thus ancient Tarsus, like modern Glasgow, made its own river and its own harbour.

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* The meaning "lagoon" for the Greek ἐῆγμα seems clear, but is not given in the Lexicons.

† The course just above Tarsus is wrongly indicated in the accompanying map, following R. Kiepert. See Appendix IV.

But, owing to the very slight difference of level between the lake and the sea, it must have required constant care to keep the harbour of Tarsus open; and in the stagnation of later Byzantine times, and the ruin and carelessness of Mohammedan rule, the harbour became closed. The operation of Justinian (though, as I believe, it was intended only as a safety-valve, carrying off a dangerous superabundance of water likely to cause a flood in the city, and not to turn away the river entirely from the city and the harbour) acted injuriously on the harbour. The old channel through the city became blocked,† and the river gradually turned its waters wholly into the freer channel on the east. Thus at present the old Rhegma is a marshy lake a mile or two west of the river, varying greatly in size at different seasons, discharging a small body of surplus water by a narrow channel into the river 2 miles or so above the sea, turning a great deal of the best land of Tarsus into useless marsh, and breeding fever and insect pests to such a degree as to make Tarsus the most trying place of summer residence that I have experienced in the whole country.

III. The Road across Taurus.

Again, Tarsus and Mallos competed not only for the sea-borne trade, but also for communication with the inner country. The influence of the Greek element is to be traced by the name of Mopsus, the prophet who led and directed the Greek traders. Mopsou-Hestia, the Hearth of Mopsus, marks the road connecting Mallos with the Eastern plain of Cilicia.

The connection of Adana with Mallos, also, seems to have been ancient. They were united not merely by their common opposition to Tarsus,‡ but also by the fact that Mallos communicated with the inner country beyond Taurus by way of Adana, which stood at the southern end of the natural pass through Mount Taurus.

But on that natural pass there was one serious difficulty (described below in Section VII.). The pass was blocked for waggon traffic by that difficulty at its southern end. This made it possible for Tarsus to compete with Adana by opening another route over Taurus.

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* These features are mentioned by Strabo in his description of Tarsus.

† But this did not finally become the case until the fourteenth or fifteenth century. Early travellers in Turkey saw the river still flowing in part through the city, in which its channel can easily be traced still, by the depression, by the gravel and pebbles below the surface, and by the piers of a Roman bridge seen by Dr. Christie under a house. The modern watercourse on the west side of Tarsus is wholly artificial, as can be seen by following it up to the point where it is taken off from the river.

‡ Dion Chrysostom speaks of their long-standing feud in his second Tarsian Oration.

Tarsian energy cut through the rocks of the Cilician Gates a new path which avoided that difficulty and placed their city at the southern end of the only waggon-road which crossed Taurus. An important point on that new Tarsian road was called Mopsou-Krene, the Fountain of Mopsus, and the name of the prophetic guide of Greek enterprise shows (as is probable on other grounds) that this great engineering work was a step in the development of Greek commerce. It was the Greek settlers in Tarsus who competed with the Greeks of Mallos.

This is the road which I now shall attempt to describe. This introduction has been intended to show that the evolution of this road, one of the great triumphs of early civilization over natural barriers, is simply one act in the long struggle for control of the markets of the country.

As we go over the road now, it needs an effort to understand how great a triumph of human skill and energy it was originally, when the path had to be found, and built, and cut. So, as one crosses the Alps by the Swiss roads, it takes an effort to understand how the Romans could think that they were an impassable barrier to Hannibal, and how Hannibal could lose half his army in crossing them, and bring only a remnant of half-starved men down on the Italian side. Taurus has never been a barrier so serious as the Alps; but it was a barrier and a terror in the classical period to a degree that we now can hardly cease to wonder at.

Of all the Taurus passes, incomparably the most important in history, and still by far the most important, is that called the Cilician Gates. The Gates formed only one single point on the road, which has a course of more than 70 miles through the Taurus mountains and foothills; but the road may be conveniently named from the Gates, as the most striking feature in ancient history, though far from the most important in modern time or in the future development of the route. But the route as a whole will long remain the greatest and the critical crossing of the whole Taurus range, though the Gates will be avoided, and the railway, if not also the road, will hereafter make its southern end at Adana, not at Tarsus.

The Great Pass has been frequently traversed by travellers, and yet it has been always difficult to find a sufficient description of its course. Every traveller confined himself to wondering and admiring; none took the trouble to make and publish notes, but trusted that their predecessors had done so. Only recently, in a traveller whom hitherto I had ranked low, I found by far the best, most accurate, detailed, and practically useful account of the whole route; and I make my apologies to his shade for a rather slighting reference to one scene in his travels, which is contained in my 'Impressions of Turkey.' The traveller was Macdonald Kinneir, captain in the service of the East India Company, who passed through the Gates in 1813, in the course of a long journey in Asiatic Turkey.

My account of the road is founded on notes made in two journeys, in 1891 and 1902. On both occasions my wife accompanied me, and the photographs, of which a few specimens are here published, were made by her. I also saw a small part of the road in 1882, in the company of Sir C. Wilson, and traversed it entirely in 1900; but the notes made on those occasions are almost entirely superseded by later ones.

The importance of the pass lies mainly in the past. Those lands have long ceased to be of any serious consequence in the world. They cannot again come to be of importance until better administration and more secure tenure have restored prosperity. But that they should ever again become of prime importance in human history, that the opening up of good communication through the Great Pass should ever become a central question on which human development depends—all that is as unlikely as anything can well be. Yet long ago the making of that road which we are about to describe was one of those critical events on which the fortunes of mankind depended, though, like many other such events, it was unrecorded and unnoticed at the time, and has since remained unregarded by historians.

Only one fact can give real importance to the Great Pass, within the range of possible experience of living men, and that is that railway communication with the East should be established by way of Constantinople and the Euphrates valley. This is the way by which such a railway is likely to cross the Taurus. So far as I am able to learn, there is no other pass which could be mentioned in competition with it, except that which leads from Albistan to Marash, far away to the east; but I cannot find that that pass is so easy to overcome as the Great Cilician way, while it is immensely more difficult to reach it from Constantinople.

There is no engineering difficulty of the slightest consequence in extending the existing railway from Konia to the northern end of the Cilician Pass; I doubt if anywhere a gradient sharper than 1 in 100 would be needed, and there is neither river nor marsh, hardly more than a brook, to cross.* Once placed at the northern end of the pass, the line has a gentle descent down a continuous easy glen—interrupted only once by a ridge of no serious consequence—for about 35 miles. In those 35 miles the descent is only about 2200 feet, giving, without any zigzags, a gradient of 1 in 80, roughly speaking.* But then comes the one serious difficulty: the glen ends before a wall nearly 2000 feet in height, with hardly any room for curves in surmounting it. The river of the glen finds its way through an underground channel; but it is no part of our task to speculate about the issue of the railway, whether a tunnel or a mountain railway would be needed. It need only be said that the expense would be very great at this point; but that if a tunnel could be made, the railway could be worked with perfect ease and without any extraordinary expenditure. No other pass offers this advantage.

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* Charshamba-Su, 20 miles south of Konia, is the largest channel (though carrying little water), and seven or eight good bridges cross it already; it carries very little water, but has a broad channel with slightly elevated ground on both sides.

Of course, no such railway could be made to pay. It cannot be a commercial enterprise under present conditions. But, even on the dead level of the Central Plateau, no railway can be made at present to pay. I doubt very much if the existing lines on the plateau, taken by themselves, and apart from the portions which lie in the coast-lands, do much more than pay the bare working expenses; and I was assured two years ago by a good authority who has a life's experience on the railways of the country, that—within the limits stated—one of those existing plateau railways did not pay even working expenses. There is, however, a steady improvement in the traffic, especially on the German Anatolian Railway.

Those railways of the plateau can be constructed only as means for developing and civilizing the country, or for strengthening its defences, not for immediate return on capital invested. But for the first purpose a railway through the Great Pass to the coast will do much; and for the second purpose that railway, if extended to the Euphrates and the Persian Gulf, will become a matter of European importance, and a centre of interest for every government and every politician in the civilized world. In view of this possibility, a somewhat minute and detailed description of the pass is not without its value.†

IV. THE ROAD FROM TARSUS TO THE CILICIAN GATES.

According to the usual rule in this country, the road from Tarsus to the Gates avoids the valley of the stream which comes down from the Gates to the city. So far as the maps can be relied on, the course of the stream is fairly direct, but there are difficulties, though I do not know that any modern traveller has ever followed the stream throughout its whole course.

The modern waggon-road issues from Tarsus by the eastern gate, which was destroyed not many years ago by the governing pasha after it had lasted, as is said, from the time of Harun-al-Rashid, and coincides for nearly a mile with the road to Adana. It crosses the Cydnus by a bridge, and then turns north and ascends the valley of the tributary stream into which Justinian diverted the main river.

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* There is a sharp descent of 400 feet at Chifte-Khan.

† These remarks were printed in 1902, before the Bagdad railway question had attracted public attention.

Since the railway Mersina-Tarsus-Adana was built, traffic from or to the Gates seeks the nearest point on the railway, viz. a station called Gulek Boghaz, about 2 miles from Tarsus. We began our journey in 1902 from this station, coming by train from Adana, and finding our travelling equipment waiting at the station. On previous journeys we came down from the Gates by the horse-road, which enters Tarsus on the north side, crossing the Cydnus by a bridge immediately below the cataracts. Thus, as it happens, I have never seen the course of the waggon-road for the first 3 or 4 miles from Tarsus.

Two miles north of the railway station, the road enters the foothills in front of the main ridge of Taurus, and follows an easy path up a valley, open at first, but soon narrowing. The whole hill district on both sides of the road is called Bairamli-Toprak (soil of Bairamli); and the central village, Bairamli, lies about 2 miles west of the waggon-road, and 10 north of Tarsus.*

This district was, certainly, much used by the ancient Tarsians for country residence. It is close to Tarsus, and yet has a healthier situation than the city in the plain. The name of Eski-Tarsus, "Old Tarsus," which clings to the ruins a mile east of Kavakli (a tiny settlement at a khan in the Bairamli district on the waggon-road 16 kilometres from Tarsus), shows that some recollection of the close relation between the city and what may be called "the suburbs" on the hills, survived in local popular nomenclature. But the principal Roman remains lie on the Roman road west of Kavakli (see next section).

At Tash-Ovasi (between 27 and 28 kilometres, 18 miles), one of two alternative roads from Adana joins our Tarsian road to the Gates, and a khan stands by the road north of the junction. In this part of its course the road traverses high, rolling, broken, but fairly well-wooded country: fir, cedar, plane, oak, and other trees abound in the country round and further north. A striking and picturesque castle, apparently mediæval, has been for some time visible at a considerable distance straight in front; it is now called Kiz-Kalesi.

After the khan the road turns more to the westward, and, after 2 or 3 miles, enters a picturesque and well-wooded glen running from north to south. The road at first keeps high on the east bank, and then crosses the stream to the right or west bank. In this neighbourhood it meets the line of the Roman road, but I did not succeed in determining the exact point. The village of Muzar, and a ruin called Yanifa Kishla, lie a little to the right of the modern road, which now leaves the glen, crosses a low plateau, and enters another glen, running north and south.

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* I speak of Roman miles throughout the paper: roughly speaking, 2 make 3 kilometres; 10 make a little over 9 English miles.

In this glen, which we now enter, flows the water that descends from the Gates. The scenery is here magnificent, and it grows more and more grand and impressive as we advance northwards towards the Gates. As we enter the glen from the east, we observe a road ascending from the stream up the opposite hillside, 400 to 500 feet, and disappearing across the hill; it is said to be the horse-road from the Gates, leading direct to Tarsus. Thus neither the horse-road nor the waggon-road follows the direct watercourse down to Tarsus.

At 38 kilometres from Tarsus is Mazar-Oluk-Khan,* where, according to the regular order of easy travel, the first day's journey from Tarsus ends. The journey is short, but we have ascended more than 1900 feet from the railway, and are now about 2000 feet above sea-level. The road here is still on the east side of the stream, and at some height above it; and the glen is more open at this point, though still confined between the two hill-ridges.

The ancient Mopsou-krene, the fountain of the mythical prophet Mopsus, is commonly supposed to have been situated close to this point; and some traces of ancient life were observed by Langlois on a wooded hill to the north of the khan. In the same neighbourhood Colonel Chesney and Mr. Ainsworth stayed at a village, Bostanlyk, "the place of gardens;" † but at the present day no such village exists. Presumably it was destroyed or abandoned when the Egyptian army held the Cilician Gates. Langlois, in 1852, who found no village of that name, doubts whether it ever existed; but the older travellers would not invent a village.

But the most serious difficulty lies in the doubt whether the Roman road traversed the glen of Mazar-Oluk. It will be shown in the following section that it probably took a different line.

North of Mazar-Oluk the scenery continues similar. The road keeps on up the gorge, and then crosses to the west side; but after a mile or so recrosses to the east bank (after the 44-kilometre stone), and immediately afterwards we reach Sarishek-Khan,‡ where the second of the two roads from Adana to the Gates joins our road. The glen here opens to a small valley, and there is considerable cultivation. One would expect that the principal town of the district should be here rather than at Mazar-Oluk, and such has been the case throughout the Turkish period, as the remains show. But Mopsou-krene could not be situated here, for the distance from the Gates is only 9½ kilometres (a little over 6 miles), whereas Mopsou-krene was 12 miles distant from them.

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* Mazar-Oluk, "Grave-hillock." Oluk is a very common element in Turkish nomenclature, much misrepresented by European travellers. This name, *e.g.*, is given variously as Mezerlyk (*i.e.* graveyard), Mazari-kolou, etc.

† It may be suspected that the ruins of this village are those which Langlois took for the traces of ancient life.

‡ Sari-Ishek, "Yellow-donkey;" called Sarik, 'Turban," by Langlois.

Sarishek is also the junction of the other road (referred to above) from Adana to the Gates,* and must always have derived some importance from being a meeting-place of roads, much superior to Mazar-Oluk in its long narrow glen. An abundant fountain of water is also a feature here. It is artificial, but the water must rise in the hills that bound the open ground not far away.

The natives declare that Sarishek-Khan was built by Ibrahim Pasha; but there are here remains obviously of the early Turkish time. This whole road affords an interesting study in the growth of mythology. Ibrahim Pasha, son of Mehemet Ali, held Cilicia from 1832 to 1840, and opened up the road to carry his guns over the mountains. He has now become a mythological hero, and almost every building or work of any consequence along the road is attributed to him, from the ruinous little khan of Sarishek to the vast old Turkish building called Ulu Kishla (" the Long Barracks ") at the northern end of the pass. Perhaps even the Arch of Severus † is attributed to him, but for this I cannot vouch. It is not strange that his victorious progress across Taurus and through Asia Minor to Kutaya, his victories over the Turks, even when Von Moltke was directing the Turkish artillery, and his abundant vigour and energy, should have caught and kept a place in the stolid and unobservant mind of the Oriental peasant. He was the last of the great Oriental conquerors, no unworthy successor of Tamerlane and Genghiz Khan, of Cyrus and Tiglath-pileser; but he fell in the age of European ambassadors and the Great Powers, and his career was arrested in the middle of his triumphant march on Constantinople.

But it is an interesting example of the general law of human nature, or at least Oriental nature, that, so far as I heard, not one word of truth or history was remembered about him along the road, though he was mentioned by almost every one we talked to. His real character and his real deeds had been entirely forgotten, and a series of demonstrably false acts were attributed to him. Some of these unhistoric acts have passed into European books, and it will be worth while to correct them as we go, and to notice from time to time the way in which this historical personage has within sixty years become a mere legend.

There is also at Sarishek a ruinous turbé, the first example which we have seen on this road of that very common kind of religious foundation. The turbé, or ziyaret, always contains the tomb, supposed or real, of some holy personage, who usually bears a Mohammedan name; but in many cases the holiness of the turbé obviously dates from pre-

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* These roads from Adana to the Gates must, of course, be distinguished from the road connecting Adana with the natural pass through the Taurus, *i.e.* the road from Adana direct to the vale of Bozanti, Section VII.

† See next section.

Mohammedan time, and it may be laid down as a general rule that the turbés are the chief of the many ways in which Mohammedanism has adopted and maintained, under a superficial varnish of its own character, the ancient religious beliefs or superstitions of the country. It is worthy of note that the sacredness of the spot is regularly associated with a grave, for that was the foundation on which the primitive holiness of places rested in Anatolia. The turbés in general have in recent years fallen into disrepair and disrepute; the revenues for their maintenance were all taken possession of by the state in the time of Mahmud II., and the government charged itself with the duty of maintaining the religious establishments—a duty which has been performed as all other duties of administration are performed in Turkey.

I tried to find out the name of the Mohammedan saint, or dede, who was buried at Sarishek, but in vain. No one knew. One old man, at last, declared the turbé contained the grave of a dede named Omar, a name which I have observed in other parts of Asia Minor as the bearer of the religious inheritance under the form of Omar-Baba ("Old-Man-Omar"); but I was uncertain whether my aged informant was speaking the truth, or merely wished to get rid of a persistent questioner by satisfying his desire for information. Every traveller has to guard against that most dangerous source of error, information given because it is evidently desired.

There must have been a small ancient town or village in this tempting position; and the Turbé is evidently the expression of the awe which always attached to the tradition of ancient life and greatness in Anatolia.* In treating that subject elsewhere, the writer pointed out that the turbé is very frequently the indication of an ancient site, and that a religious map of the country would be a good guide to its ancient history. A town necessarily was a religious fact as well as a social fact, and no religious fact seems ever to be entirely lost in Anatolia. The local religion is permanent amid all changes in the national religion.†

Even the mere junction of two roads was a religious fact to the ancient mind; and the religious idea of the Three Ways was anthropomorphized as a goddess in Greece and Rome. The form which that religious fact assumed in Asia Minor requires investigation in a more suitable place; but there is some probability that the symbol called Triskeles was in Asia Minor only a rude indication of the meeting of three ways—a symbol which, when the craze for solar symbolism was at its height, was interpreted as the sign of the sun in its course. The symbol is often found on coins of the cities of that country.* Sarishek, then, is situated at a place sacred as a meeting of three ways.

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* It is necessary to add that there is in the gorge, a mile or two north of Mazar-Oluk, but on the opposite bank, a sacred tree: in my notes there is only the vague information that it is between the kilometre-stones 39 and 40.

† See a paper by the present writer on the "Permanent Attachment of Religious Veneration to Localities," *Transactions of the Oriental Congress in London*, 1892, pp. 381 ff.

The sides of the gorge grow loftier, and the gorge itself narrower, as we advance. The road crosses the stream by bridges five times between Mazar-Oluk and the Gates. At about 49½ kilometres from Tarsus we reach Giaour-Harman, in a small opening of the gorge, and at 50 kilometres a new khan called Ala-Begirli. Thirteen minutes after Ala-Begirli † there were visible, what I took at first for the foundations of a Roman bridge, barely appearing on the surface of the ground at the edge of the stream about 20 feet below on our left; but as there seemed to be no trace of or place for a Roman road on the opposite side, the foundation must have been intended to carry the wall or arch supporting the road.

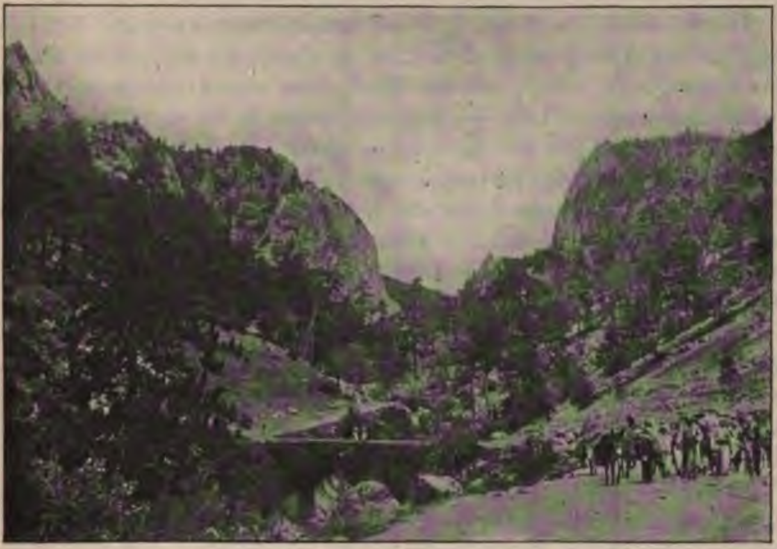

FIG. 1.—APPROACHING THE CILICIAN GATES FROM THE SOUTH.‡

At last there appeared in front of us a lofty ridge or wall of rock, stretching from east to west right across the line of our path, the front wall of the main mass of Taurus. It can hardly be less than 1500 feet in sheer height above us, as we first see it. It would bar the progress of any one except an active mountaineer, were it not for a narrow cleft which pierces it from north to south, where the water of the stream finds a passage from the broad back of the Taurus plateau down through our gorge to the Cilician Plain. This cleft is the Cilician Gates in the strict sense. Six minutes before reaching the entrance the road crosses the last bridge, and passes the Gates, 54 kilometres from Tarsus, on the west or right bank of the stream. The view from beside the bridge is singularly grand.

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* It is confined almost entirely to cities where the Hellenic spirit was weak and Hellenic education little known; *e.g.* Olba, Adada, Etenna, Aspendus in early time, and early Lycian coins. It belongs, therefore, to a religion which was non-Hellenic, and it disappeared when a Hellenic varnish was put over Anatolian religious ideas.

† Our course here was very slow, as the surface of the road is very bad. As a proof of the uncertainty of dead-reckoning by time of march, on which my route-surveys have always been based, it may be mentioned that our driving-time per kilometre varied between six and twelve minutes.

‡ The appearance of height in the mountains cannot be truly given in the photographs; this is especially the case in Nos. 1 and 9, where they are dwarfed.

V. The Roman Road from Tarsus to the Cilician Gates.

In 1902 we had to choose between two alternative courses—either to examine the modern waggon-road, or to search for the precise line of the Roman road. We preferred the former course, partly because it seemed more useful in a geographical point of view, partly because the search for the Roman road might require a long time, which we had not at our disposal, and partly because we could thus travel by waggon, which, while less pleasant, is also less expensive. The modern road has been measured, and many kilometre-stones erected at rather uncertain intervals along it; so that it now forms the foundation for a geographical study of the region.

The general course of the Roman road is certain in the first 12 miles north of Tarsus, and in the final part between Sarishek and the Gates. In the latter it coincides almost exactly with the modern road; in fact, nature offers no alternative. The intermediate part of the road is uncertain.

The chief question is whether the Roman road followed the water (as the modern road does) down from Sarishek to Mazar-Oluk. In this part we observed no trace of old work, building or cutting, and though this is not conclusive (as it would take a long time to examine sufficiently minutely to justify a confident negative), yet it creates a doubt whether the ancient road traversed this southern part of the gorge.

The known facts about the course of the Roman road may be summarized as follows:—

The modern road at first keeps to the lowest level along a small stream. The Roman road followed a more direct course, 1 to 2 miles west of the modern line, on higher ground; but though this line is more undulating and broken than that of the modern road, yet by more expensive works the Roman road may probably have been made as suitable for traffic as the modern line. A little to the north of Bairamli, Langlois in 1852 traced the line of the Roman road for a distance of 2 kilometres; and the same line is still well marked, running almost directly north about 2 miles west of Kavakli. He says that it is paved with large slabs, and is 3 metres broad. His account is confirmed in every respect by the Rev. Dr. Christie of Tarsus, who recently followed the line of the road in that part, and sent me photographs.

On the summit of a high plateau, about 1400 feet above the sea (according to his estimate), a triumphal arch spans the road.* It is still almost as perfect as when Langlois saw it in 1852. Situation and construction show that the arch is of the Roman time. Langlois says that tradition assigns it to Constantine, but he does not specify what he means by tradition. There is not, in the strict sense, any tradition in the Turkish lands about the origin and character of ancient buildings; there are merely the fancies of modern inhabitants who have acquired some education. The view which elsewhere I have ventured to suggest † is that this is the ruin of a triumphal arch, built by the Tarsians in honour of the victory of Septimus Severus in 194 A.D. Severus came down through the Gates, and defeated his rival Pescennius on the coast near Issus. In commemoration of this event an arch was erected near the scene of the victory on the Syrian frontiers; but the Tarsians mention on their coins a different arch, which they erected at a place in their own territory near the northern frontier. The place was named Kodrigai, a Graecized form of the Latin Quadriga, because the arch was surmounted by a four-horsed chariot carrying the deified emperor. The name is given on coins of Tarsus in the third century, which show that games were held by the city on the high, open, undulating plateau which the Roman road here traverses.

Immediately beyond Sarishek-Khan, when the gorge again narrowed, we began to find traces of the Roman road, and these were nearly continuous till the Gates were passed. The ancient road was made in the steep bank, by cutting the rock on the higher side and by building on the lower side, so as to give a sufficiently broad platform. The ancient cuttings of the rock can be distinguished at a glance from the fractures made by blasting for the modern road, which also is a work of considerable magnitude and well executed, except between Sarishek and the Gates.

It was also noteworthy that the Roman road was always, so far as I observed, throughout this part of the gorge, on a higher level by 3 or 4 feet than the modern road.‡ There must, therefore, have been a great amount of building to support the ancient road; and in the Roman fashion that was, beyond doubt, done with cut stones. Yet I did not observe a single cut stone in the whole length of the gorge, though in one case I noticed by the water-side the cut foundations to carry the supporting wall (see the preceding section).

I mention this, as some of those who have not seen the Midas-city in

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* It is more than a mile north of Bairamli village, and about 2 west of Kavakli.

† *Bulletin de Corresp. Hellenique*, 1898, p. 237G.

‡ Precisely the same observation was made by the German botanist, Th. Kotschy, about sixty years ago (Ritter, Kleinasien, ii. p. 281).

Phrygia have expressed doubt as to my identification of the line of walls of the ancient city, on the ground that I did not find a single one of the stones of which the wall was built, but only the rock-cuttings made to receive them.

One must be struck with the contrast between the numerous traces of the Roman road here, and the absence of traces in the glen of Mazar-Oluk. It seems probable that the Roman road, coming south down the narrow glen from the Cilician Gates, diverged from the glen at Sarishek, and kept away slightly east of south over the Boz Bel, and so down to somewhere near the village Muzar. This gives a more direct route, and the appearance of the country as one looked north from the neighbourhood of Muzar, or south from Sarishek, did not suggest that there was any obstacle insuperable to Roman engineers, who were not fettered by considerations of cheapness in laying out their roads.

Kinneir in 1813 followed the course which has just been conjectured for the Roman road. He describes in his clear and accurate way his route from the Gates as far as Sarishek-Khan (which he does not name), "near the mouth of the gorge." Formerly I thought this was a mere lapse of memory on his part, due to his confusing Sarishek with Mazar-Oluk. But when the theory of the Roman road was wrought out, Kinneir's accuracy was triumphantly established. He came down the gorge till it widens at Sarishek; there he turned away south-south-east, as he says, "through a country interspersed with gentle slopes." Though the traveller coming from Mazar-Oluk finds Sarishek about the middle of the defile, yet one coming from the north thinks that the defile ends at that little open glade with its fields and buildings; provided that he does not go on to Mazar-Oluk and discover that the gorge closes in again immediately. But Kinneir turned away south-south-east, through "a country interspersed with gentle slopes," a description which suits the supposed Roman route well, and the Mazar-Oluk road very badly.

After reading several times Kinneir's clear and carefully estimated description of his journey through the Great Pass, one becomes convinced that he turned out of the gorge at Sarishek, and travelled direct to Muzar and Bairamli without seeing the continuation of the gorge at Mazar-Oluk. With some travellers one might suppose a lapse of memory and a mere omission of the lower part of the defile; but Kinneir was evidently keenly interested in the Great Pass, and describes it stage by stage more accurately than any other traveller who has written about it, and his careful and spirited description may serve as proof that this route, now never used, is both possible and direct.

If this theory as to the course of the Roman road (as indicated on the map) be correct, the historically interesting site of Mopsou-krene on the road would have to be looked for a little way north of Muzar; but no proper exploration of this region has ever been made.

The ordinary view is that Mopsou-krene was situated at Mazar-Oluk, but in examining the locality it seemed to me that as to this identification of Mopsou-krene there is some doubt. Our authorities give the distance from the Gates as 12 Roman miles, *i.e.* 18 kilometres; but Mazar-Oluk-Khan is only 16 kilometres from the Gates. Moreover, a position in this narrow glen seems unsuitable for an ancient town. I should rather look for the site about a mile south of the Khan, on the high ground where the modern road from Tarsus enters the glen, even if it should be found that the Roman road went through the pass of Mazar-Oluk.

On the other hand, it must be acknowledged that Langlois saw the ruins of a small church of the basilica form, and that there is a good fountain at the Khan. Also the discrepancy as regards distance is slight, for anything over 11 miles would be called 12 in the Itineraries. Moreover, Mopsou-krene is not called a town by our authorities, and may have been a mere *mansio.*

I do not know, however, what is the source from which the fountain derives its water; the art of conducting water in hidden channels for a long distance is a branch of engineering art—perhaps the only branch—in which ancient skill has persisted through the Turkish period;* and as a rule it was only natural sources, not artificial fountains, which made for themselves a place in ancient local nomenclature. But I am under the impression that the source is actually at the Khan.

When Theophanes calls Mopsou-krene the first halting-place from Tarsus on the north road (πρώτη μονὴ ἀπὸ Ταρσοῦ, p. 46), no inference bearing on this question can be drawn. Mazar-Oluk is the first halting-place for those who are making an easy journey, and Sarishek for those who are travelling fast. Just as little inference is allowable from Ammianus, who says that Mopsou-krene was the last station for travellers before they passed out of Cilicia.

The idea suggested itself to me at first that Mopsou-krene might have been beside Sarishek, which clearly was the site of an ancient village, and that the distance from the Gates should read as VII., not XII. But a fragmentary inscription found in Rome, giving a route from Tarsus† northwards, seems conclusive that Mopsou-krene was several miles south from Sarishek. The first day's journey ended at Mopsou-krene, the second at Panhormus (evidently a large inn near the modern Tekir-Khan), the third at Aquæ Calidæ, the fourth at Tynna, the fifth at Tyana, the sixth at Andabalis (the modern Andaval). Of these the fourth, Tynna, is unknown, but we must suppose it was about halfway between the third and fifth. This route evidently implies that each day's journey was between 18 and 22 miles, and the document gives excellent evidence of the ordinary rate of travelling [*] in ancient time (which is the same as that assumed by me in reckoning the itineraries of St. Paul). It also proves that Mopsou-krene was about 6 miles south from Sarishek, or 2 south from Mazar-Oluk, exactly as the Jerusalem Itinerary places it, 12 from the Gates (and 22 from Tarsus).

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* 'Historical Geography of Asia Minor,' p. 88. In those cases where I have seen native water engineers at work, or heard about them, even in the heart of a purely Mohammedan region, they have been Greeks.

† It is quoted in the 'Historical Geography of Asia Minor,' p. 68. The name Tarsus is lost, but can hardly be doubted.

Mopsou-krene never became a bishopric. Probably the territory of Tarsus extended up to the Gates, and Mopsou-krene was merely a village in the Tarsian land. The inscriptions, "Bounds of the Cilicians," occurs both on the rock-walls of the Gates and on the coins of Tarsus; and coins of cities rarely, if ever, mention anything outside of the city territory.

VI. The Cilician Gates and the Tekir Summit.

The actual passage of the Gates is about 100 yards long. On both sides the rock walls rise almost perpendicularly (that on the west side literally so, at one point to about 100 feet above the road), and then slope steeply back towards the towering summit of the ridge. A mediæval castle crowns the western summit, evidently a relic of the long frontier warfare between Byzantine and Saracen power, 641–965 A.D.

There has been some rather loose writing about the narrow passage of the Gates, and the Ibrahim Pasha legend is strong here. I have heard it reported that two loaded camels could not pass one another in the Gates, because they were so narrow, until Ibrahim made the opening broader by blasting the rocks; and this statement was repeated by me in conversation, before I had seen the Gates, as a report which I had not verified. A still more exaggerated form of the story may be found.

But examination of the pass shows that such reports are erroneous. Ibrahim did much for the road, but he did not widen the passage a hair's breadth. He simply cleared and rebuilt the ruinous road. The difficulty for camels before his time lay not in the narrowness of the gap between the rock walls, but in the appalling character of the path, which was covered deep with a mass of loose rough rocks, worn slippery and smooth by rain and river-water, and by the passage of men and animals. He probably used powder to break up the stones which encumbered the passage, and thus the legend grew.

Kinneir mentions that at the narrowest part the defile was "not more than ten or twelve paces from rock to rock." Not knowing of his statement, I guessed the breadth at 30 to 40 feet; and Oberhummer, in 1898, speaks of 9 to 10 metres: thus estimates before and after Ibrahim's time agree.

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[*] On this subject see an article on "Roads and Travel in Roman times" in Hastings' 'Dictionary of the Bible,' vol. v.

It merely requires a plain statement of the facts to show the exaggerated character of the legend. A road practicable for waggons traversed the Gates at least as early as 401 B.C., and remained in use until the Arab invasion in the seventh century after Christ. In the Roman period this road was about 11 feet broad, as is plain at other points. A river also ran through the Gates, which in the wet season must carry a considerable body of water, sufficient to sweep away all vestige of a road unless plenty of space were left free for the torrent.

Moreover, I observed no trace of blasting,* such as one sees in abundance further south down the Pass, and also on the northern side. But at least it can be asserted positively that the roadway throughout the length of the Gates is cut by ancient hands from the rock, and the west side (which the road has always taken) shows the ancient surface practically unchanged.

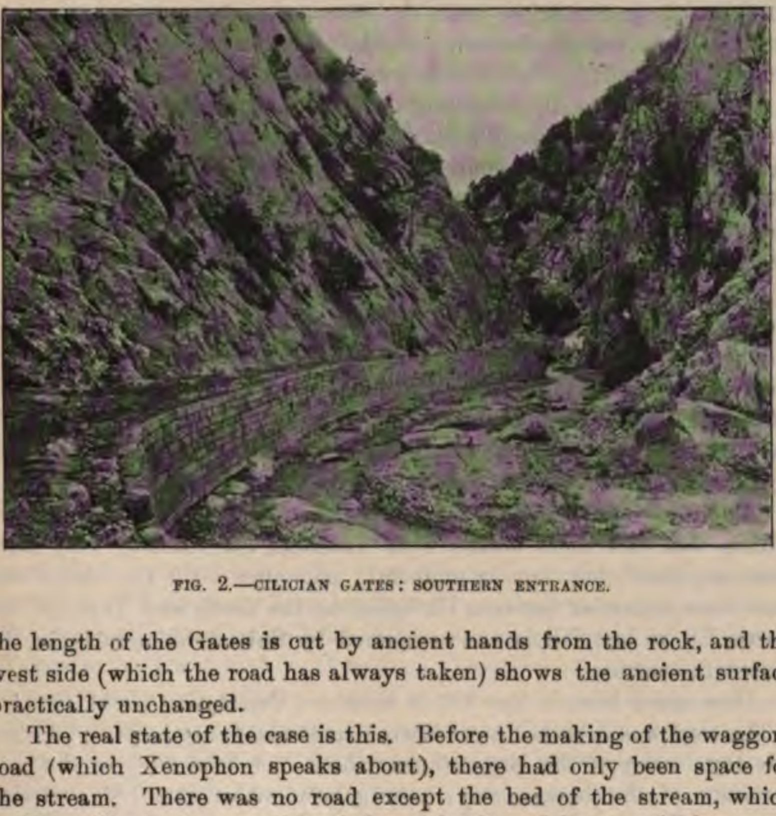

FIG. 2.—CILICIAN GATES: SOUTHERN ENTRANCE.

The real state of the case is this. Before the making of the waggon-road (which Xenophon speaks about), there had only been space for the stream. There was no road except the bed of the stream, which could readily be traversed by laden animals and by men during great part of the year, but, when the water began to increase, was impassable in parts, and dangerous everywhere. Room was made for the road by cutting the rocks on the west bank, while the stream was left with its channel unimpaired.

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* I feel very confident on this point, though I confess that I did not look carefully for traces.

Now, the question is, when and why was this road constructed? It obviously impairs, though not seriously, the defensive strength of the Gates against invasion. When the Gates formed the northern boundary of a small state, there was, from the political point of view, every inducement to keep the passage narrow and difficult, and thus impede the march of an enemy.

The reason for that really great work of cutting a waggon-road through the Gates lay certainly in trade. This was the final blow in the long contest between Tarsus on the one hand and Mallos with Adana on the other hand for the command of the traffic with the inner lands. The possession of the sole waggon-road across Taurus gave the undisputed superiority to Tarsus. It remained probably the sole waggon-road for many centuries, until the Romans made one from Laranda to Olba and Corycus, following much the same course as the modern waggon-road built by Said Pasha from Laranda to Selefke.

Quintus Curtius, in describing the seizure of the Gates by Alexander the Great in 333 B.C., says that four armed men could barely march abreast through them. This statement must, of course, be understood of the roadway. The Romans improved the path, but it is practically certain that the extreme breadth of the Roman road through the pass was 11 feet, and Langlois states it at 3 metres.

The Roman road through the Gates fell into disrepair in later centuries, and this was not entirely due to natural causes. When Taurus divided the Byzantine from the Arab power, it again became important to make the passage difficult. One of the most obvious ways of doing so was to roll down masses of rock from above; and, at any rate, in such a gap there are likely to be, in the course of centuries, occasional falls of rock disintegrated by natural causes.

In 964, when Tarsus again fell under Byzantine authority, and Cilicia was once more united with Anatolia, the roadway may have been improved, but this is doubtful; and after 1072 the Gates was once more a barrier between Christian on the south and Turk on the north, till at last Cilicia was conquered by Sultan Selim early in the sixteenth century.

How much history lies hid in Kinneir's description about 1812!—"The road was in so bad a condition that it could only be passed during the day; many of the large stones, which had been used in the construction of the Roman way, having been either removed or fallen down, whilst the surfaces of those that still remained in their places were smooth and slippery."

Nothing was actually done to improve the roadway until Ibrahim Pasha found it necessary to carry his guns across the Pass. This improvement was not maintained; but in the time of Said Pasha, about 1882, an effort was made to facilitate traffic, and the road was made passable by waggons, though there was still much difficulty at various points. Again, recently the road has been greatly improved, and it is easy to drive up to the Gates from Tarsus, though the surface is sometimes rough. North of the Gates the road is now even better than south.

After issuing from the Gates the road passes a guard-house on the left, and enters an open valley, rising rather steeply in front, grown with small fir trees and scrub. Following the right bank of the stream, which here flows from west-north-west to east-south-east, after 10 minutes the road crosses to the left bank, and keeps along it for 45 minutes (passing the 56-kilometre stone at 10 minutes from the bridge, and a khan at 42 minutes). We then turn up due north across the ridge, and in four minutes reach the watershed and the 59-kilometre stone (at 59 minutes from the Gates). The ridge here is broad and level, so that the 60-kilometre stone is much on the same level, about 4250 feet above the sea. The ground is open and stony. High on the right is a fort, seemingly round in form, built by Ibrahim Pasha.

This little plateau, called Tekir, is the middle summit of the Cilician Gates route. There is a higher level at the northern end to traverse before the Central Plateau of Asia Minor is reached, but the ascent there is so gentle that Tekir, with its steep slopes to north and to south, is naturally regarded and spoken of as "the summit of the road."

After the 60-kilometre stone the ground slopes down rapidly to the north, and a little way down the slope stands a small house of entertainment—Tekir Khan. At the khan, which is the humble representative of the ancient Panhormos, mentioned in the document quoted above one naturally halts to review the situation, and study the historical bearing of the localities.

The Gates were the defensive point for Cilicia in ancient times. In that narrow pass, as Captain Kinneir says, "a handful of determined men might bid defiance to the most numerous armies." The position would in that age have been impregnable, unless an enemy could cross the rocky ridge and come down in the rear of the defenders. But from Tekir one sees that that could be done: assailants from the north could get over the ridge either on the east or the west into the gorge south of the Gates. It was therefore necessary to defend the ridge also, and thus the line of defence was widened. It was probably in the time of the Byzantine and Arab wars that a castle was built on the west summit of the ridge, overhanging the Gates and the gorge south of the Gates, but some guard-house may have existed earlier.

In spite, however, of this element of weakness, the Gates formed a great and strong defence, which strikes almost every traveller with admiration and awe. The importance attached to it in military operations, such as the Anabasis or the march of Alexander the Great, is entirely justified by its nature; and the reason why the Crusaders called it the "Gate of Judas" is clear, for it was the natural enemy of their cause and the betrayer of their safety. As the Arab proverb said, "He that fears not the Boghaz fears not God."

But in modern warfare the Gates is not the important point. It can be swept from end to end by cannon from the open ground to the north, while on their side the defenders of Cilicia would be involved in several difficulties which it is unnecessary to describe.

When in 1839 the boundary between the Ottoman and the Egyptian power was fixed at Ak-Keupreu, a point in the pass 20 miles north of the Gates, Ibrahim Pasha (or rather his chief engineer, a Pole, Colonel Schultz, also called Yusuf Agha) had to select a line of defence. At first historical tradition made them try the north front of the Gates; but they soon abandoned this scheme,* and selected the Tekir summit. This little open, stony plateau, about 1 mile by 2 miles, offered an excellent position. The approach from the north is up a steep and narrow defile, down which a stream runs east-north-east to the Vale of Bozanti. The defensive works consisted (as Langlois and Ainsworth are agreed) of eight forts, running obliquely across the plateau from east-south-east to west-north-west, presenting a front of about 2½ miles, and mounting over a hundred guns. On the east and west the plateau is shut in by hills of moderate elevation, and a watch-tower was placed on the eastern hills, and a blockhouse on the western. The lines could be held (according to Langlois) by a force of 3000 men.

As the approach from the north was up a narrow glen, the fire of all the forts could be concentrated on the mouth of the glen. Other points of military interest are described by Ainsworth (a traveller commissioned by this Society) and by Langlois. But our interest lies mainly in the conditions which alter the points of importance at different periods of history. The summit was of little consequence in the ancient defensive system, whereas it is the prime point in the modern system. The summit required an army to hold it, whereas in ancient times, when few soldiers were maintained permanently, points of defence were sought that could be held by very small bodies of untrained men. In the ancient system either the top of the narrow glen leading down north to the Vale of Bozanti or the Gates was the point on which the defence would rest; and the north glen offered more opportunity for flank attack on the defending posts, and needed a larger body of defenders, so that the Gates was the point of defence and the boundary between tribes or provinces. The Gates alone was preserved in the memory of history. In modern time the summit is the inevitable line of defence.

Accordingly, ancient history attaches no importance to the Tekir plateau. Langlois, indeed, considers Tekir to be the place called the Camp of Cyrus; but this is certainly an error, as an incident of Alexander's southward march clearly proves. There was a night march of some distance from the Camp before the attacking party (led by Alexander the Great in person) came in sight of the Gates and saw that they were undefended, whereas at Tekir the whole camp would practically be in sight of the Gates. There are also other reasons which prove that the Vale of Bozanti was the Camp of Cyrus; and the inevitable rendezvous for an army preparing to force the Gates.

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* Langlois says that the scheme was put in operation to some extent, and found impracticable.

So hastily did Ibrahim evacuate Cilicia in 1840 that all his cannon are said to have been left on the forts of Tekir.* The eastern fort is still a striking feature in the landscape; but the forts have long ago been dismantled, the guns removed, and the buildings left to moulder gradually away, under the gentle influences of nature, like most things in Turkey.

VII. THE VALE OF BOZANTI (PODANDOS).

In descending the glen described above as leading down to the Vale of Bozanti, the road is bordered on the right by the Anasha-Dagh, 6000 feet in height. The road which leads down that narrow glen from the Tekir summit keeps to the west bank of a small stream which rises close behind Ibrahim Pasha's lines; but between 65 and 66 kilometres from Tarsus it crosses to the right bank and reaches Aiva-Bey-Khan. The descent is extremely steep for more than 2 miles before reaching this khan. Immediately after leaving the khan the road crosses again to the left bank of the stream, then leaves it 3 miles further on, and goes over some hills, rising 200 feet, and again descending to the Vale of Podandos, still called Bozanti.†

High on the mountain, overlooking the Vale of Bozanti (Podandos), is Anasha-Kalesi, described by Langlois as a Byzantine fortress, built of black marble. Its wonderful situation, and Langlois's account of the material, make it seem more like a castle of the Arabian Nights than a real fortress. Its history can be traced from the eighth century onwards. It was called by the Arabs Hisn Assakaliba, the Sclavonian castle, because a garrison of Sclavonians was planted on those mountain slopes and glens. These seem to have been the Sclavonians who deserted by thousands from the Byzantine side in the seventh century. In the eighth and ninth centuries the castle was taken and retaken several times, but on the whole seems to have been generally held by the Saracens.

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* My estimate of the height of Tekir summit was 4240 (allowing it 80 feet above Tekir Khan) in 1891, and 4300 in 1902. Major Bennet and Colonel Stewart (who was afterwards with Gordon in Khartum) agree in allowing 4300; Ainsworth has 3812; Oberhummer 4607 (with the same allowance as in my estimate). My estimates depend on aneroids lent by the Society.

† There must have been an ancient by-form Pozandos. Compare Nadiandos-Nazianzos ('Hist. Geogr.,' p. 348), Ariandos-Arianzos, etc.

The Byzantine name for it was apparently Rodentos, and the crusaders mixed up the two names, Rodentos and Podandos, and called it Butrentum.* The numerous crosses, marked by many good crusaders on the rocks near the castle, are an interesting monument of those wonderful marches of the early crusades. They are described by Langlois; I have not seen them.

Even the most hearty opponent of epigraphy must feel some interest in those memorials, among which it is possible that Godfrey and Tancred, Baldwin and Bohemund,† inscribed their marks, and must surely regret that those heroes were unable or unwilling to write their own names. The common mercenary soldiers—Greek or Carian—who marched in the service of an Egyptian king to the southern frontier of Egypt, six centuries B.C., could scrawl their names and a record of their march and its purpose as they passed by Abu-Simbel, each in his own language; but few of the nobles of France or Germany could do so eleven centuries after Christ.

The Vale of Podandos is described contemptuously by the great Cappadocian churchman, Basil of Cæsareia, as a mere pit or barathrum in Mount Taurus, which illustrates the indifference of the ancients to the picturesque aspect of nature and their dislike for mountains. Round it on every side the mountains stand up steep to the height of 5000 to 7000 feet above the sea. The Vale itself, which is about 4 miles long and 2 broad, is level, oval in shape, abundantly supplied with good water, and about 2750 feet above the sea. It is the natural rendezvous for an army marching from the interior to force the passage either to Tarsus or to Adana. Here Cyrus the Younger encamped when Xenophon and the Ten Thousand Greeks accompanied him in his attempt to seize the crown of Persia, and the place retained long the name of the "Camp of Cyrus." At present there is only the scantiest population in the neighbourhood—a few scattered huts and small villages or yailas among the mountains, and some nomads' tents and two khans in the valley. But in ancient times the beautiful and fertile Vale, where three routes from the north and two from the south met, must have been a populous and busy settlement.

The stream which comes down from Tekir enters the Vale some way to the right of the road, and joins the river that flows southward through the Vale. This river, which is called Bozanti Su or Chakut Su, rises on the Central Plateau and flows in a general south-easterly course through Taurus to join the Sarus some miles below Adana. Our road meets it here, and will follow its course upward from this point to the source of one of its arms; but its course downwards to the Sarus may be briefly noticed at this point.

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* Constantine Porphyrogenitus distinguishes Rodentos and Podandos, mentioning both, along with Loulon, as the southern points of the Cappadocian Theme. I wrongly supposed in *Historical Geography*, p. 352, that this was an error of Constantine's, and that Rodentos and Podandos were one place.

† The routes of the First Crusade are obscure and deserve fuller study; but Baldwin and Tancred at least must have traversed the Gates, as they took Tarsus and Mopsouestia.

The river flows off to the south-east from the Vale, and a path leading to Adana goes along its bank. After a few miles the rocks close in on the river and narrow its bed, so that the road has to leave it and ascend the mountain-side. The bed of the stream grows more narrow and difficult. Colonel Massy traced its course for a certain distance, till he could go no further except in the river-bed, and I do not know that any one, except the engineers surveying for the Anatolian Railway extension, have followed it further. They report (as Colonel Massy informed me) that the mountain closes in over the river, which flows into a hole and disappears. This mountain is evidently the same front ridge of Taurus which a little further west was surmounted at Tekir by the Cilician Gates road. The river emerges on the other side, but I could learn nothing as to its exit, or the exact length of its underground course: this cannot, however, be very long, as the road from Adana to Sarishek follows the lower course of the Chakut for a considerable distance, and above that its course is known by report for a good many miles further. Moreover, the river bears the same name below as above, and in similar cases where the

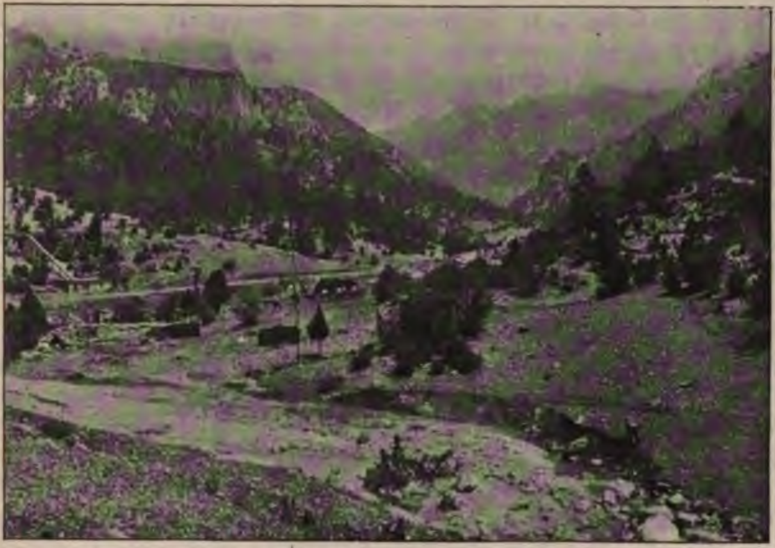

FIG. 3.—THE VALE OF PODANDUS (BOZANTI).

underground course is long, I have always found that the name is changed, even though the connection of the upper and lower streams is firmly believed in by the people.

Obviously, nature marks out the path from the Central Plateau to the Cilician Plain as being down the Chakut to Adana; and the railway will doubtless take that course, if it can elude the one serious difficulty by a tunnel. But the road has to go over the mountain, and the ascent and descent are said by Colonel Massy to be much more precipitous than on the Gates route. It must, however, be remembered that the latter road represents the result of several thousand years' fitful work, and that Greek and Roman and modern European engineers have all laboured to improve it. But this Chakut road direct to Adana (which was said by the natives at Bozanti in 1891 to be an easy path) has been very much left to nature; and the fact that it is now far inferior to the Gates route is no proof that it might not have been made equally good by care and energy.

The question remains for settlement—it is one that I had proposed to myself for the journey of 1902, but found that there was little hope of settling it without a long period of work and a different equipment *—whether any traces can be found of an ancient road down to Adana along the stream. I am for the present reduced to reasoning, which is less satisfactory and convincing than actual discovery.

When Mallos, with the aid of Adana, was competing with Tarsus in early times for the Cilician trade, this natural line of road down the stream from the plateau to Adana must inevitably have been used. But when Tarsian energy had developed the less obvious route through the Gates, and made the magnificent harbour, Tarsus became the unquestioned capital of the lower valley, while Adana apparently allowed the Chakut route to remain unimproved, till it sank into insignificance. Yet it was used as late as B.C. 401, when Cyrus the Younger evidently entered Cilicia by this way.

Xenophon's description of the crossing of Taurus has always been a riddle, but the solution is now quite simple. The soldiers of Cyrus advanced from Tyana, which lies on the plateau in front of the northern end of the Great Pass. As King Syennesis of Tarsus was said to be on the heights guarding the pass, they remained one day in the plain. By the "plain" Xenophon means the Vale of Bozanti, for, though he had been among the mountains for a considerable time before reaching the Vale, yet the march from Tyana to Bozanti is entirely (except for the crossing of one ridge below Lulon) along a level easy path, with a

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* Such an exploration may, by good luck, be achieved in a few days, if one chances on some decisive trace; but, on the other hand, the traces of an ancient road often lie concealed close at hand and escape notice: hence it may take a long time to prove a negative.

very gentle rise from Tyana for nearly 20 miles, and then a long gentle descent to Bozanti.

The pass which Syennesis was guarding was clearly the Gates, because it was a road practicable for wheeled traffic; and it seems at first natural to suppose that Cyrus advanced by the same road, for a messenger came to report to him that Syennesis had abandoned the heights; and thereafter the army of Cyrus ascended the heights, and saw the tents where the Cilicians were keeping guard, though we have just previously been informed that Syennesis had abandoned the heights. It is noteworthy that Xenophon at this point speaks only of the heights, and not of the Gates. Had he seen them, he would hardly have spoken so much about the heights, *i.e.* the summit, and kept absolute silence about the critical point which was guarded. Considering how apt and well chosen are Xenophon's brief accounts of what he saw on the march, it seems incredible that he could have described the pass of the Gates in terms so inapplicable, if he had ever seen it. Other travellers, especially Kinneir, have remarked on the unsuitability of his account to the localities. That acute observer, Kinneir, felt convinced that Cyrus did not traverse the Gates, but frankly confesses that he cannot specify the route. He finally takes refuge in the supposition that Xenophon may have forgotten; but we shall find this unnecessary.

Of course, those who are determined to make out that everything in the ancient writers is perfectly accurate and perfectly in accordance with our present knowledge (however inaccurate our present knowledge may afterwards turn out to be)—all that large class of scholars will easily find that Xenophon is here describing the Cilician Gates, when, without mentioning the one really important and impressive point, he tells how the army climbed the heights, and looked on the Cilician tents, and then descended the other side.

But the decisive proof that Xenophon did not cross through the Cilician Gates lies in the fact that he descended into a large and beautiful plain, and thereafter marched four days' journey (25 parasangs, *i.e.* 62 or 63 miles) through the plain to Tarsus.*

Contrast this with the account of Alexander the Great's march. He halted at the Camp of Cyrus, *i.e.* in the Vale of Bozanti. Then during the night he advanced with some chosen troops to surprise the Gates. The guards at the Gates, seeing him advancing over the summit, abandoned their post and fled. They knew that there were other paths across the mountain wall, and were afraid that they might be taken in rear. Thereafter Alexander occupied the Gates with his whole army, and in one day swooped down on Tarsus, about 34 Roman miles, downhill the whole way—a good march, but quite possible.

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* This seems decisive against Sir C. Wilson's suggestion, otherwise very tempting, that Xenophon crossed the ridge by the path above the Gates mentioned in Section VI.

Xenophon describes the march from Tyana to Tarsus as being through the plain for some considerable distance, then across a mountain, and then for over 60 miles to Tarsus through the plain. This is true of the Chakut route if we bear in mind that both on the north and south he speaks of a road along an easy, very gently sloping glen as being "through the plain." It is remarkable that Xenophon states time and distance in every march across Asia Minor except the one from Tyana through the plain (*i.e.* to the Camp of Cyrus) and across the mountain ridge; but it is quite characteristic of the ancient style to omit some numbers in this puzzling way, as every reader of the Acts of the Apostles knows. The march, being a dangerous one, was probably made slowly and with frequent halts.

Obviously, Xenophon's 62 miles from the foot of the mountains to Tarsus is wholly inconsistent with a passage of the Gates; but it suits quite well with the route that goes down the Chakut water. Cyrus climbed the mountain, where the stream goes under it, descended the other side, and was then obliged to follow the river for some distance, and at last turn away south-west to Tarsus. In this way he would have about 60 miles' march to Tarsus after he had descended into the low ground from the mountain.

Our conclusion seems irresistible. One way of eluding it is to suppose, as some have done, that Xenophon means that the whole march from Tyana to Tarsus was 62 miles. But that is impossible, both because the meaning of the words is quite plain, and because the distance from Tyana to Tarsus by the shortest road is fully 95 miles.

Xenophon made one mistake. He was at this time an obscure volunteer, who had not access to the best information, and he thought that Syennesis had been defending the route by which the Greeks advanced, and hence he says that the king had been defending the heights; but there can be no doubt that the main Cilician defence rested on the Gates, 500 feet below the summit of the road. But, even though the Cilician king had abandoned the Gates, Cyrus shrank from attempting that road. The pass below the Gates was difficult, resistance was possible at several points, and Cyrus evidently desired to occupy Cilicia peaceably, relying on the co-operation of the Cilician queen.

Apart from that one misconception Xenophon's account is clear and simple, in keeping with the directness and accuracy of his whole narrative.

The history of Podandos was wholly governed by geographical considerations. It was naturally a place of great importance in the Roman Empire, as the maintenance of communication along the great Cilician and Syrian road depended on it. In the strange mixture of royal governments and Roman provincial boundaries that characterized the first century after Christ, the maintenance of Roman communication between the provinces by retaining command of the Great Pass was a prime necessity; and the command of the Pass depends on the possession of Podandos.

Yet, to judge from the books, Podandos was at that time the most insignificant of places, never requiring to be mentioned. But its situation, while ensuring a distinct importance for it as an administrative centre for the Taurus district,* and as a centre of communication at the meeting of four roads (perhaps even of five †), was also so confined as to prevent all possibility of great development. Moreover, it evidently suffered from the foundation of the city and Roman colony Faustinopolis,‡ 25 miles north-west, on the same Great Pass. It may be presumed that the new city enjoyed imperial favour; and its situation made it a better centre for the northern Taurus district than Podandos.

When in A.D. 372 the Emperor Valens divided the huge Province Cappadocia into two parts, Prima the northern and Secunda the southern, Cæsareia continued to be capital of the northern part, and Podandos was chosen as capital of the southern part. There can be no doubt that the choice was due to its importance as a centre of communication; but the choice was vehemently resented in the country, and strenuously opposed by Basil, who describes Podandos as like "the Spartan pit Ceadas (into which criminals were thrown), or one of those natural chasms breathing a noxious vapour, to which people have given the name Charonian." The issue finally was that Tyana was made the metropolis of Second Cappadocia.

The bishoprics of Cappadocia Secunda now ceased to be subject to Cæsareia. This change also was vehemently resisted by Basil; but in vain. He instituted several new bishoprics to strengthen himself, and one of them apparently was Podandos. Podandos was obviously a part of the Province Secunda which contained the southern half of Cappadocia, yet Basil seems to have succeeded in maintaining the ecclesiastical relation between Cæsareia and Podandos, though the civil administration must still have regarded Podandos as part of Secunda. Basil was aided by two circumstances to maintain the ecclesiastical relation contrary to the civil. (1) There was a road, practicable for horses but probably not for carriages, which connected Podandos directly with Cæsareia without passing through Tyana, as the great route did. This road diverges from the great route at Podandos and goes straight north, keeping high up on the east flanks of the lofty mountains called now Ala-Dagh (a long and striking ridge, covered with eternal snow[*] all along its jagged summit, said to be 11,000 feet high, running like a great wall from south to north, a projection from the Taurus range, but diverging much from the line of that range). This road has been much used in recent centuries for such traffic as was carried from Cilicia to Cæsareia, because the longer Roman route had sunk into such a state of disrepair as to be passable only by pack-animals; and it is probably the route called Karydion in Byzantine times. That view seems to be proved by the name Funduklu, still attached to a village on the road.[†] That being so, the glen by which our road leaves the Vale of Podandos and goes on to the west or north-west, is the Byzantine Maurianon (see 'Historical Geography of Asia Minor,' p. 350). (2) The see of Cæsareia owned the revenues of the monastery of Orestes, which was apparently somewhere in the neighbourhood of Podandos, and this connection strengthened the ecclesiastical bond.

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* Taurus, really an elevated broad plateau rather than a mountain range, presents, even in this very broken part, many high-lying glens and open places which were once much more populous than they are now.

† These are (1) by the Gates to Tarsus, (2) to Adana, (3) to Cæsareia direct by Karydion or Funduklu, (4) to Tyana and to Heracleia by Loulon—the road which is the object of this study, (5) a horse-road to Tyana diverging from (4) at Takhta-Keupreu (see below).

‡ See Section IX.

Hierocles, who was much influenced by the ecclesiastical lists, was betrayed by them into the error of placing Podandos among the cities of Cappadocia Prima, though there can be no doubt that the whilome civil capital of Secunda must have been ranked by the civil authority in that province; and Hierocles aimed at constructing a list of civil, not ecclesiastical, character.

In later Byzantine time Podandos was separated from Cappadocia and transferred to Cilicia. This implies that the Cilician frontier was pushed north from the Gates for some distance; and it is probable that the new frontier was fixed at the narrows immediately west of Chifte-Khan, though a point nearer White-Bridge is possible (see below). The time when this change was made is uncertain. It was later than Hierocles (about A.D. 530); and it is not likely to have been made except as part of some general reconstruction. When the Themes were instituted, probably by the Iconoclast emperors in the eighth century, Podandos was still connected with Cappadocia, of which Theme Constantine Porphyrogenitus says that it formed the southern limit.

The transference, therefore, had not been made before the Arab conquest of Cilicia about 650; and, if so, it is not likely to have been made until Tarsus and Cilicia were recaptured from the Arabs in 965; for it would be absurd to place a town, which was in dispute between

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[*] Mr. Hogarth informs me that he does not believe the snow lies all through the summer on Ala-Dagh. There has always been snow on it and on Hassan-Dagh (said to be lower by nearly 1000 feet), so far as my experience (insufficient to prove the point) goes; and the popular story is that Ala-Dagh is always snow-clad.

[†] The name Funduk is found also as an Oriental form of the Greek *Pandocheion*, "an inn" (see Buhl in Hastings, 'Dict. of Bible,' V., art. on *Roads and Travels in O.T.* ; Krauss, 'Griech u. Lat. Lehnwörter im Talmud,' etc., ii. p. 428; Neubauer, 'Géogr. du Talmud,' p. 172); but that form is not likely to have occurred in this case. Funduk is the Turkish translation of the Greek *Karydion*.

Byzantine and Saracen armies, under the authority of Tarsus, which was definitely a Saracen city. On the other hand, it is only natural that, when Tarsus was recovered, the long-disputed line of the great road, which had become so closely associated with the long-lost city, should be formally placed under its authority; and so we find the bishopric of Podandos under Tarsus in a very late Oriental Notitia.*

VIII. From Bozanti to the Vale of Lulon.

The road keeps on to the north through the Vale of Bozanti, past two khans, and turns to the north-west along the right bank of the Chakut, through a glen which grows narrower as we ascend. South of the point where the glen opens on the vale, the ancient Podandus may be placed. Past the 80-kilometre stone we cross a bridge, called Ak-Keupreu ("White Bridge"), which is the boundary of the vilayets of Adana and Konia, and which was formerly the boundary between Turkey and Ibrahim Pasha's realm. When Ainsworth passed along this road in November, 1839, the advanced guard-houses on the Egyptian side were placed at the point where the glen opens on the Vale of Bozanti, while the main line of defence on the Tekir plateau has been described above. The Turkish advanced posts were close to the west of the White Bridge, and their main lines at Chifte-Khan, about 8 miles further up the glen.

The Ibrahim legend is here again in evidence. Already in 1839 Ainsworth says that the White Bridge was built by Ibrahim Pasha, but this is incorrect. The bridge, as we saw it in 1882, 1890, and 1891, was evidently a mediæval work, and quite picturesque, with its steep ascent to a high central point and its sharp descent on the other side. It was very narrow, about 7 or 8 feet across. Ibrahim's bridges were not of that style. But, naturally, he was not eager to facilitate the passage across his frontier, and left the old bridge, which Captain Macdonald Kinneir saw in 1813.

White Bridge is placed at the narrow end of a funnel. The rocky hills north and south of the stream here close in till they nearly meet, and there are few spots more picturesque than the approach to the bridge from the Vale of Bozanti. The old White Bridge, too, was suited to its surroundings; but between our visits in 1891 and 1902 it was replaced by a much more commodious and less picturesque structure, and is now a broad level viaduct, approached by high embankments on each side. The southern approach has completely covered up and destroyed the beauty of two springs, which rise under the rocks close to the bridge on the left hand as we ascend the stream. One was about 20 yards below the bridge, and the other close to the southern end of the bridge. The latter, called Sheker Bunar ("Sugar Spring"), now runs out through a small tunnel in the substructure of the bridge. The rocks have been blasted along this stretch of road, which was formerly difficult; and the lower spring, which was formerly extremely picturesque, is now unrecognizable; and both might readily be passed unobserved by travellers.

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* The published *Notitiæ Episcopatuum* as a rule are confined to the Patriarchate of Constantinople, and therefore omit all Cilicia, Syria, Palestine, etc.

Above the bridge another very large spring, called Kara-Su ("The Black Water"), rises under the southern mountains. The story is that this spring, whose water is bad and fever-producing, comes from the Bulghar Maden (Mines), so that straw thrown in at the mines comes forth by this spring, and that it poisons the waters of the Chakut-Su. This spring was called Rakha by the Arabs; and the belief in its poisonous character can be traced as far back as the ninth century, when the death of the Khalif Al-Mamun was attributed to this cause. The story is told by the Arab historian as follows:—

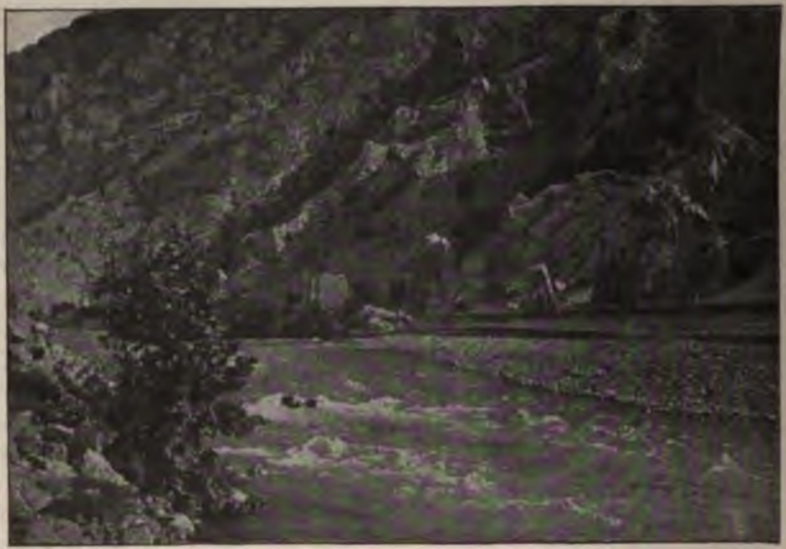

FIG. 4.—LOOKING UP TOWARDS WHITE BRIDGE: RUINED OLD BRIDGE.

Returning in A.D. 883 from an expedition into the Byzantine territory, the Khalif Mamun encamped by the side of the beautiful stream, whose waters were so clear that the legend on a silver coin, which was thrown in, could be read as it lay at the bottom, and so cold that it was impossible to bathe in them. Mamun saw a fine fish in the water, and promised a reward to the man who should bring it to him. A servant caught it, but as he was handing it to the Khalif, the fish slipped out of his hand back into the stream, and splashed the ice-cold water over the royal robes. The fish was again caught; but hardly had the order been given that it should be fried, when the Khalif was seized with a chill, and began to tremble like a leaf. His attendants covered him with garments, and lit a fire; but he continued to complain of the cold, and when the fish was brought cooked to him he could not eat it. He asked the name of the stream: it was called Koshaira, "stretch out thy feet." He asked the name of the district: it was called Rakha. Then he remembered the prophecy that he was to die at a place called Rakha, on which account he had always avoided the city of that name. That night he died; and Mutassem, his brother, reigned in his stead, and carried his body to Tarsus and buried it there.

There is here an evident confusion of the two springs, the beautiful water below the bridge, and the immense volume of water above it. Ainsworth notices only the sweet spring; while Kinneir draws a striking picture of the large upper spring, and has nothing to say of the lower springs. He says that the "torrent bursts from an abyss in a manner most extraordinary, and containing a mass of water equally great as the Seihun" (the name which he wrongly applies to the Chakut-Su, which is only a tributary of the Seihun). Now, Kinneir saw the Chakut in flood, enlarged by many tributary torrents that poured down the sides of the mountains in the gorge. Langlois also speaks only of the Kara-Su ("the Dark, Mighty Water"). The accounts of these travellers, apparently irreconcilable with one another, really relate to different springs, yet all declare that there is only one.

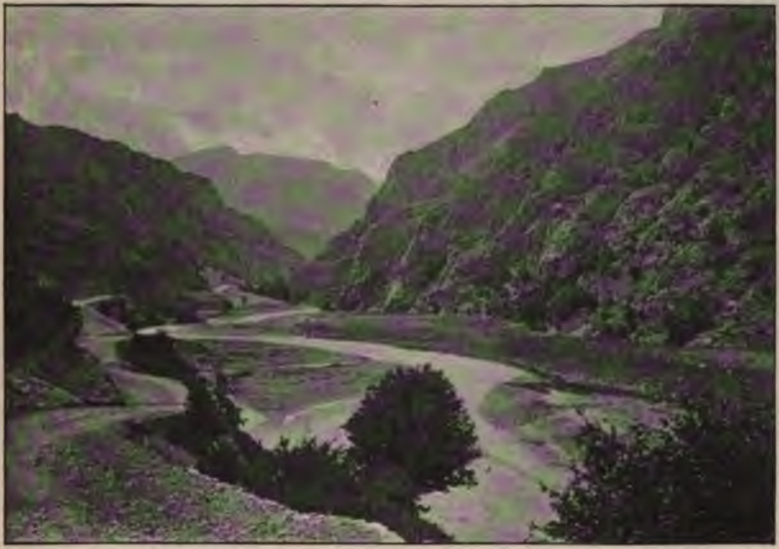

FIG. 5.—LOOKING DOWN TOWARDS WHITE BRIDGE.

At the north end of the White Bridge a new khan has been built in the last few years, which is, if possible, dirtier and more miserable than the old khans on this route. The line of the Roman road can be traced very clearly beside and below the khan. It did not cross at the White Bridge, but ran along the left or north bank till at least 500 yards further down. Much cutting was needed to make room for it on this bank, and three gateways have been cut through projecting spurs of rock, varying in breadth from 13 to 15 feet. At the left as one enters [*] on the first gateway is an obliterated inscription, which we examined with eager curiosity in hope of some historical evidence; but after some trouble found it to be only a pious expression, "Lord, help Martyrius, the deacon," engraved in good letters of the early Byzantine or late Roman period—perhaps the prayer of some pilgrim to Jerusalem along this pilgrims' road.

Below this first gate is the ruin of an older and even narrower bridge than the old Ak-Keupreu; it was clearly a mediæval work.[†] Of the Roman bridge we saw no trace, though we walked down along the Roman road to the end of the rocks. The Roman bridge was situated in an open part of the glen, and has been entirely carried away by the storms and floods of a thousand years. Here, as further south, the Roman road was on a high level, and there must have been an elaborate substructure to carry it along in many parts; only where the rock level was high can we still trace the line.

But more than nature was at work to destroy the Roman road. This was the road by which the Arab armies came to harry the Byzantine province and to besiege Constantinople itself, and there can be no doubt that difficulties were thrown in their way by destroying the grand Roman road. But as to this we are not left to mere reasoning; we have the definite proof in Ibn Khordadhbeh's account of the road about the middle of the ninth century.

"After leaving Podandos one travels through a narrow pass, called the Two Clefts (*les deux fentes*),[‡] traversed by a river which one has to ford twenty times, to the hot springs, which are separated from Louloua by an easily crossed hill. After crossing this ridge, Louloua lies in front. Thence one goes to a castle" (evidently Hirakla, near Eregli, which preserves the name).

The Roman road kept on the north bank the whole length of this glen, and must have been completely destroyed before the path could be forced to cross and recross the stream so often.

The sides of the gorge above the White Bridge close in more narrowly, and this is, on the whole, the most picturesque and magnificent part of the whole route. On the south the mountain rises practically perpendicular, to the height of quite 1000 feet. I should guess even a greater height, and should add that for a long distance it looks as if a stone dropped over the top would fall clear down to the bank of the stream without touching the rocks; but in such matters the eye is a fallible witness. The plants and moss in the crannies of the rock impart a strikingly beautiful variety to the colouring, in some seasons of the year at least; but even this colouring does not detract from the awe-inspiring character of that vast almost overhanging wall. On the north side the hills rise nearly as high, but slope more gradually, and as the road keeps close to this bank the whole way, and the path has been in many places blasted by modern or cut by Roman hands out of the face of the hill, one does not get the same impression of a towering precipice as on the south side.

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[*] I mean from our view as we walked back down the glen after crossing White Bridge, tracing the line of the Roman road.

[†] It can be seen in Fig. 4, on the north bank.

[‡] The name still lingers in Chifte ("Twin") Khan, at the upper end of this part of the pass.

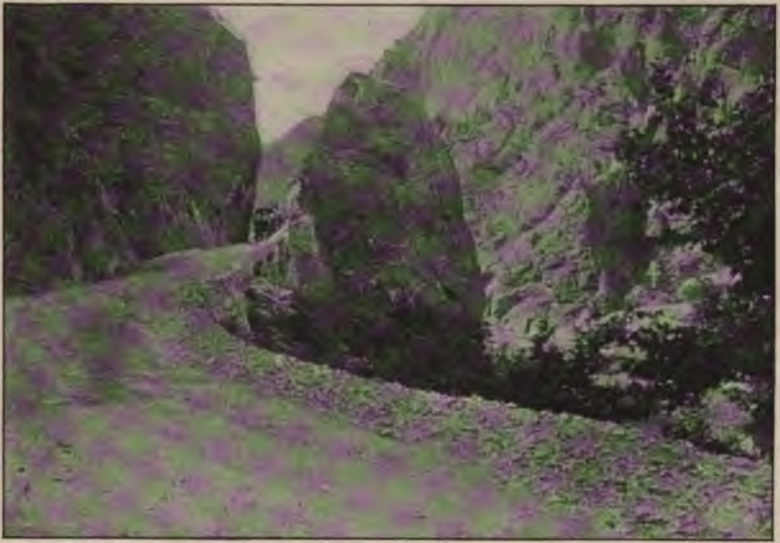

FIG. 6.—ROMAN ROAD CUTTING, WIDENED BY BLASTING TO TAKE MODERN ROAD.

The road from White Bridge onwards, which was exceedingly bad in 1891, is now excellent, almost as good as a Swiss diligence road in the Alps.

Two minutes after White Bridge we observed the 85-kilometre stone from Nigde, implying that White Bridge is about 85¼ kilometres distant from that city, the modern capital of this region or Sanjak (*lit.* Standard) of Konia Vilayet. Nigde is about 12 miles beyond Tyana, and henceforth for convenience we shall mention the miles from Tyana (here XLV.).

Four minutes after White Bridge there is a good deal both of Roman cutting and of modern blasting of the rock, and the two processes are here very clearly contrasted (see Fig. 6).

At 80½ kilometres (XLII. Tyana) we cross at Takhta-Keupreu ("Wooden Bridge") a stream coming in from the north. This stream rises in a great number of rivulets far up to the north-west, on the edge of the Tyana plain, and the horse-road to Tyana and Nigde goes up its course. This road must have been an important one in the Saracen wars, as offering an alternative route to Tyana and the river country, and avoiding the strong castle of Lulon, when that fortress was in Byzantine hands.*

The view was long held that this path up the Takhta-Keupreu water was the line of the Roman road to Tyana, and my 'Historical Geography' (p. 346) † was written under that misapprehension. The true route was discovered on our journeys of 1890,‡ after the book was printed, but before it was actually published. The Roman road, whether to Tyana or to the west direct by Herakleia-Cybistra, keeps straight up the glen which we are ascending; this path, though a little longer, is much easier.

About the 77-kilometre stone (XL. Tyana), a road goes off right to the Hamam ("Hot Baths"), and nearly a kilometre further on we cross the water that comes down from the Baths. Ainsworth tried to quench his thirst with this water, and found it warm. But even if I ever broke the rule not to drink on the march, the sight of the Hamam, on a visit which we paid to it in 1882, would have for ever prevented me from drinking of that stream. The establishment is now of the most wretched character, and presented a singular contrast to the stately building which is figured by the roadside on the old Roman road map called the Peutinger Table. It lies only a few hundred yards back from the main road, though not within sight of it, in a recess of the mountains; and we observed no trace of ancient work. After the 75-kilometre stone (XXXVIII. Tyana), the road from the Baths westwards joins us, and soon afterwards we reached Chifte-Khan, "the Khan of the Twin Clefts." Between 75 and 69 we saw no kilometre-stones;

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* It is not impossible that this may be the Karydion route, though, for the reasons already given, that route is more probably to be identified with the path leading straight north from Bozanti.

† The only change needed in p. 346 is to read Ulu-Kishla in place of Pashmakji. In pp. 351–354, where the subject is more elaborately discussed, no topographical alteration is needed (except that Weil's identification of Assakaliba as the Arab name for the castle of Lulon must be deleted (see Section VII. for the correct view)). The conclusions about Lulon, Faustinopolis, and Halala, there attained by a long argument of only probable kind, are now conclusively proved (see Section IX.).

‡ I traversed this route for the first time in that year; and my companions, Mr. Hogarth and Mr. Headlam, found two milestones on it. In 1902 my wife and I found a third.

this was unfortunate, as our time suggests that the Turkish measurement is not accurate here.*

At Chifte-Khan a stream from south-west comes down a most beautiful glen and joins the main stream. This stream flows from Bulghar-Maden (mines of argentiferous lead), past the village of Ali-Hoja.† The meeting of the two streams has suggested the name, which means "Twin-Khan." The pass has been more open for the last mile, and the meeting of the two streams makes a charming little valley.

Ainsworth, in 1839, saw the main Turkish lines defending the pass at this point. They were a poor contrast to the really strong works of Ibrahim Pasha on the summit of Tekir.

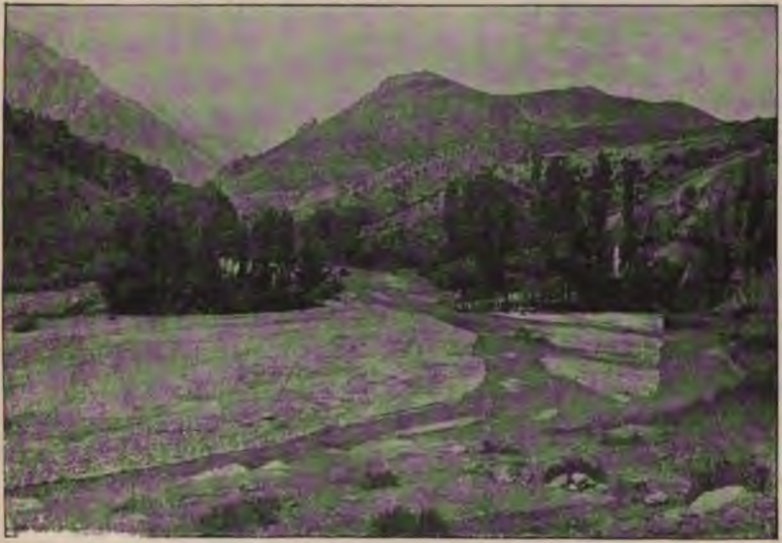

FIG. 7.—TWIN-KHAN (LOOKING UP BULGHAR-MADEN WATER.)

Immediately behind Twin-Khan the southern hills close in and narrow the glen, and the modern road follows the course of the stream, to the south bank of which we cross beside the khan. The road then ascends a fairly steep slope, but is well planned and well built. I took no reading at Twin-Khan, but estimate the altitude as 3240 feet. Twenty minutes beyond it the altitude was 3600 feet, and the stream there was far below us out of sight: the rock sloped down from our road till it almost met the sloping rocks of the north bank: there remained between them a narrow chasm, cut as with a knife—so narrow that, to us far above, it looked not more than 8 or 10 feet across—and far down at the bottom of that chasm the stream made its stormy passage.

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* We went from 75th to 69th stones in twenty-two minutes; though we drove very fast along the good road to Twin-Khan, this rate seems incredible, especially as we walked on foot up the ascent west of the Khan. I suspect that the measurements were made by the longer path over Giaour Sindikh (see below), and left unchanged when the shorter way through the gorge was built.

† Called Alaguga by Ainsworth.

Immediately after the 68-kilometre stone (xxxiii. Tyana) there is a narrow old bridge at a lower level spanning the chasm, which here is broader. The older horse-road used to cross here from the south bank to the north. The modern road keeps the south bank for a kilometre further, when it crosses by a new bridge (elevation 3630 feet). Just before this bridge there is a break on the north side where Kochak Dere comes in. In this part there is a little green with some trees and grass; but otherwise all this gorge from Chifte-Khan to Giaour Sindikh, 4 miles long, is absolutely desolate, bare rock, without a plant or a blade of grass visible, in striking contrast to the beauty of the Vale of Chifte-Khan.

The new road through this sterile gorge is exceedingly well built, and must have been very expensive; but, of course, the work is done by forced labour, on an admirable and perfectly humane system, every man being assessed a week's labour in the year, which is applied on the roads in his own district. This assessment is the least burdensome and most productive method of taxing a poor and hardy population, whereas even a very small tax in money would be felt oppressive, and more than half of the amount paid would be diverted to the pockets of officials, while most of the rest would in other ways fail to be applied to the road-making.

A road like this is one of the occasional signs which cheer the traveller in Turkey with the assurance that the country has still much latent strength. Anatolia has long been the seat of vitality of the Turkish State, and it is so still.

In general, I may say that on this journey we were more struck than ever before in Anatolia with the obvious signs of prosperity and increase in the population; and this was not in a region where the railway had come, bringing some activity and energy, but in simple and pure Turkish land. The excellent harvest of the preceding year had something to do with the appearance of prosperity; but that would not explain the increase in the number of villages and the breaking up of new ground, with which we were impressed since we traversed the same country, though as far as possible on a different line, eleven years previously.

The reason lies to a great extent in the administration of the present Vali of Konia, Ferid Pasha,* a man who possesses the governing instinct and capacity, who has learned much from modern European method, but applies what he has learned, not with the rigidity of a mere official trying to force European ways on an untrained, undeveloped, and unresponsive Oriental race, but with the free, rough-and-ready natural power of one who sees what is possible and gets his work done in a way that the people are fit for. Hence, on the one hand, as I was told, he has greatly increased the revenues which the Vilayet sends to Constantinople, and, on the other hand, I can vouch from personal experience for the fact that the increase is accompanied by obvious signs of increased prosperity among them, and by the most perfect order and quiet. During the last two years we travelled widely in the Vilayet, and found not the slightest trace of disorder, such as we have often observed in previous years in that and in other parts of the country. Such is always the case, in our experience, when a capable man is in authority: within two or three months the influence of a strong will and the steady pressure of a firm hand are apparent

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* He is now Grand Vizier; but the above was in print before his promotion occurred.

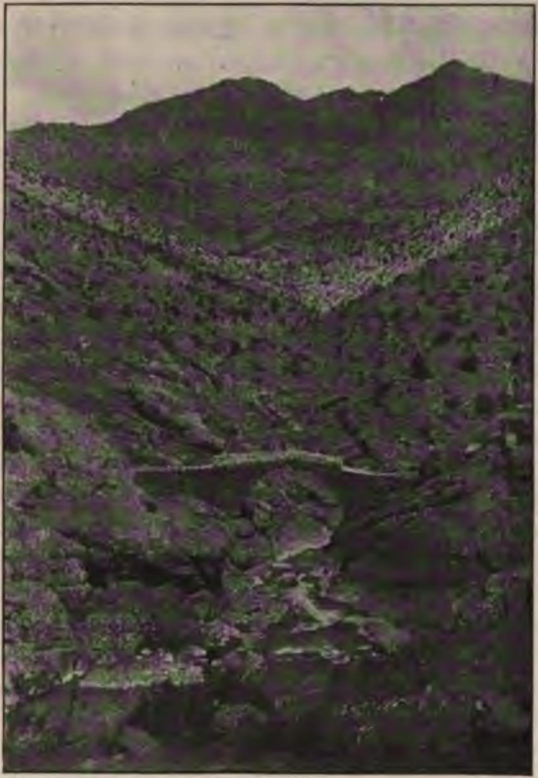

FIG. 8.—OLD BRIDGE IN THE GORGE BELOW LULON.

from end to end of his province, and you can travel with as little fear of trouble or danger as in the most orderly country of Europe. But, when you inquire into the origin of the administrator, you will find that he is either an Albanian, like Ferid and the other great ruler whom I have previously mentioned, or belongs to some other of the races that possess the governing faculty. The surgeon's knife is much needed in Turkey, provided it be applied with judgment; but perhaps there are few countries in Europe where it might not be applied with benefit to the national health.

The hills between Chifte-Khan and Giaour-Sindikh are the ridge, which Ibn Khordadhbeh describes as "easy to cross." By this he can hardly mean that it was easy in comparison with the road which he has been describing immediately before, between Bozanti and Chifte-Khan; for, however much that stretch of road might have been broken in order to delay the passage of invading armies, it could hardly have been made so bad as the hill road necessarily was. The Arab geographer is speaking as a soldier who had often made the march, and his meaning probably is that an army had less need to fear opposition on those comparatively open hill slopes than at other parts of the Great Pass. The gorge would in itself be easily defended; but the hills on the south are hardly more difficult than the gorge, and therefore the defenders' position in the gorge would be untenable. But along the rest of the Great Pass it was rarely possible to go round the flank of an opposing force, and the road must be won by direct attack if an enemy barred the way.

Just where the gorge begins to open a little there is an old bridge about the 64-kilometre stone (xxx. Tyana). Here the earlier araba road crossed from the south side of the stream and joined our present road. This old araba road ascended the hill from Chifte-Khan, keeping a line some way south of the gorge, and at last descended, by a very steep and difficult path, down a series of broad natural steps, to the south bank of the stream, beside the bridge. This gigantic staircase is called the Giaour-Sindikh. The bridge is about 4100 feet above the sea, showing a considerable rise from Chifte-Khan. Here ends the ridge alluded to by Ibn Khordadhbeh as lying before Lulon.

IX. THE VALE OF LULON, AND THE CAMP OF THE ROMAN KING.

The glen now opens gradually as we advance, but is still very bleak. After passing the 63-kilometre stone we reach Tossun Ali, or Tossun-Khan, and beyond 61-kilometres (where we did not see a stone) is a mill.* Here a more open valley spreads out before us, gentler and tamer in character than the previous part of the pass; the hills here slope gently, and the meadows by the stream are pleasant. The main ridge of Taurus, the Bulghar-Dagh, bounding the southern horizon with its long snow-clad ridge at a considerable distance, now comes into full view for the first time. Previously it could not be well seen, because it was concealed behind the high intermediate mountains. We now see that the vale is formed by the junction of two streams, one coming in from the south-west, bringing the waters of the front slopes of Taurus main ridge, the other being the line of our road, coming down from the west. We learn from Ibn Khordadhbeh, quoted above, that this is the Vale of Lulon. After crossing the ridge, says the Arab geographer, the traveller has Louloua before him. This settles finally a topographical and historical problem of great interest—the situation of the great fortress of Lulon, which was the "bulwark of Tarsus," because, when the Arabs of Tarsus held that fortress, they could prevent a Byzantine army from entering the Great Pass. But Lulon was the watch-tower of the Byzantine Empire when the Christians held it. It was the starting-point in the line of beacon-fires by which news of an Arab raid was telegraphed to Constantinople, until the worthless Emperor Michael (842–857 A.D.), annoyed that his amusements in the amphitheatre were interrupted by the signal, ordered that the practice should be discontinued.

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* The name was hesitatingly given as Porsukh-Deirmen, from the nearest village, Porsukh.

When the fashionable process of whitewashing all the proverbial villains of history is applied to the Byzantine time, it will be pointed out that Michael's act was misrepresented under the dynasty of Basil the Macedonian, who dethroned him; that the Saracen power was sinking low at that time and was no longer a menace to Constantinople; and that therefore it was no longer wise to throw the capital in disorder at every raid, as these could be dealt with by the ordinary armies of Anatolia. But the fact remains that the Arab power was still the great enemy, that peace and prosperity could not be hoped for in the empire until those raids were made impossible, and that Constantinople was only too apt to forget about the provinces and attend only to its immediate interests.

After the 59-kilometre stone (xxvii. Tyana) we pass Cheshmeli-Khan, and between 55 and 54 Dubekji-Khan. Immediately after the 54-kilometre stone (between xxiii. and xxiv. Tyana) the road from the mines of Bulghar Maden to Tyana comes in from the south-east, and a few yards further on is a disused cemetery by the roadside, on the right. In it are three milestones, one of which is marked "xxiii. from Tyana," and another is inscribed with the distance from the Gates. Unfortunately, the latter number is a puzzle; it has the form—

XXXVIΛ
ϵ

Without entering into the arguments and the difficulties, I may state the conclusions which seem probable and, for the most part, practically certain.

(1) The group of milestones stood together at this point, close to where the roads forked. It was usual to have quite a group of stones at each mile along the roads in this country. But still, most milestones have been carried from their original places, and some proof is demanded in this case. The proof lies in the numbers. The distance XXIII. from Tyana is correct.* The distance from the Gates, according to the Turkish measurements, is 57½ kilometres, *i.e.* XXXVIII. Roman miles.

(2) The distance from Tyana to the Cilician Gates along the modern Turkish road, which necessarily follows the same route as the Roman (for no other is possible),† is about 92 kilometres, and the distance on the Roman road must have been LXI. miles; and, as these milestones are XXIII. from Tyana, they must have been XXXVIII. from the Gates. Hence the number XXXVIΛ. on the milestone is a slip of the engraver for XXXVIII.; he made the last two lines meet instead of keeping them parallel, being perhaps a Greek workman deceived by a carelessly written copy (as is not uncommon with Latin inscriptions in this country).

(3) The number ε means that this is the fifth milestone in the territory of the city which was situated in the Vale of Lulon. One of the milestones gives the name of this city as Colonia Faustiniana, the Roman city founded by the Emperor Marcus Aurelius as a memorial of his wife, Faustina, who died here on a journey through the Great Pass. This stone, then, was the fifth since the road entered the territory of Colonia Faustiniana. The other supposition, that this milestone was the fifth from the Colonia,‡ has been found to be impossible, because the site of the Colonia is certain, and no point 5 miles from it on the road could be XXXVI. or XXXVIII. from the Gates, or XXIII. from Tyana. But the territory of Faustinopolis (as Colonia Faustiniana was called in the Greek speech) is very clearly marked by nature; and the boundary between it and Tyana must have been in the gap on the north through which the road goes to Tyana, about 4 miles distant.

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* In an unpublished article (summarized in the recent Supplement to vol. iii. of the Corpus of Latin Inscriptions), I estimated the distance to Tyana as XXI., according to my own itinerary, and inferred that the milestones had been carried from a point 2 miles away on the east. The Turkish measured kilometres show that the distance to Tyana is XXIII. (53¾ kilometres to Nigde).

† Except that the Roman road probably went across the ridge west of Chifte-Khan by a longer way, south of the gorge, which the new waggon-road follows, and nearer the line of the old waggon-road.

‡ That supposition was followed by me at first, and appears in the Supplement to Corpus and among the topographical identifications which I inserted in the account of this route in Sir C. Wilson's Handbook. It implies that Ulu-Kishla was the site of the Colonia.

(4) The village where Faustina died was called Halala. This village stood near the cemetery of the milestones, and the Vale was the territory that belonged to it; in other words, Halala and Lulon are the same district. This was demonstrated by indirect arguments in my 'Historical Geography,' and from this identity the approximate site of Halala—Faustinopolis—Lulon was deduced. Such identity does not mean that the old Anatolian village, the Roman colony, and the Byzantine fortress all stood on the same spot. It means that they were the centres of population and government selected at different periods for the same tract of country, viz. the vale where we are now standing and the uplands and glens of Taurus, with some rich mines and a considerable population in old times.

The inscriptions prove that the Roman colony was here. The route given by the Arab geographer proves that Lulon was here. The proof is perfect, and to complete the subject it only remains to find the exact sites.

The village can hardly be identified; it would leave too little trace to give certainty, but it was probably at the fork of the roads to Tyana and to Ulu-Kishla, near the modern villages Bey-Aghyl and Porsukh.

As to the others, it is only necessary to bear in mind what was the situation proper, on the one hand to a Roman Colony, and on the other hand to a Byzantine castle in the Saracen wars, and one picks out the sites without hesitation. About half a mile to the south-east is a well-marked little plateau, about 50 to 100 feet above the vale. This plateau is the eastern apex of the hills which divide two streams, coming respectively from south-west and north-west. It has the appearance of having been modified by the hand of man, so as to present a level surface and a steep exterior. It stands close to the Great Road, in a situation very convenient for trade, and yet capable in Roman hands of being made a strong fortress. The old Turk who watches our operations and the strange instruments which we use tells us, when we ask him if there are any remains of antiquity hereabouts, that on that plateau they abound, and that marbles and cut stones have been dug up there. We visited the place in 1891, but owing to the crops growing over the site we could learn nothing from observation; and the same cause made a visit in 1902 useless. Without doubt that is the site of the Roman city and Byzantine bishopric, which was called at first Faustiniana Colonia, but as Latin soon ceased to be spoken by its inhabitants, the Greek name Faustinopolis came into use.

Now we look to the north where a high peak towers about 1000 feet above us, and examine it through our glasses for traces of walls. We can see none, yet this looks an ideal site for a castle such as came into fashion during the Arab wars. At that time the sudden rush of a Saracen raid carried by storm a city like Faustinopolis, ill defended by its peaceful and untrained population, who had lost all military instinct and capacity, and were an easy prey to the hardy barbarians, whose sole business was war, and whose chief aim was death in battle as the climax of a career of victory. What was needed was a castle on a high peak, where nature aided the garrison to resist the rush of the Arab storming party. Such a fortress, indeed, could be reduced by famine and thirst; but the Arab incursions were in most cases mere hasty raids, and it was not often that, after the first energy of Saracen attack was spent and Constantinople had three times resisted their long blockades, they were willing to face the severe winter weather of the Central Plateau north of Taurus.

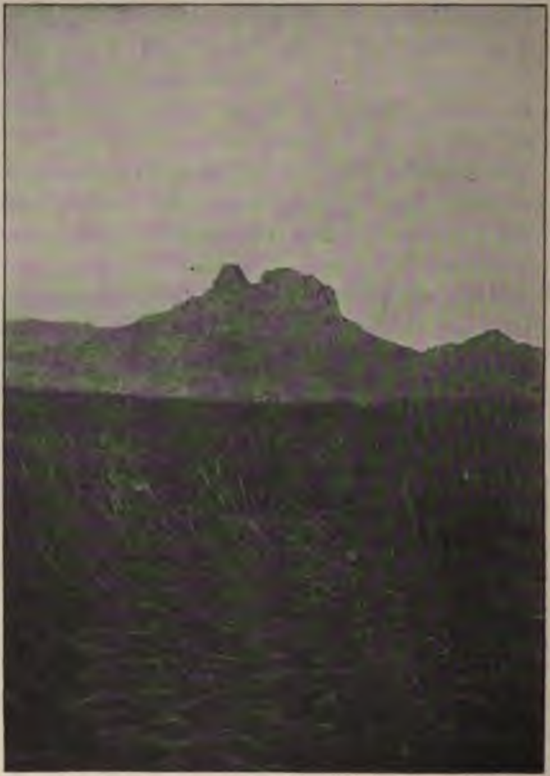

FIG. 9.—THE CASTLE OF LULON (FROM THE SOUTH).

For such a purpose that lofty peak is an ideal situation. The road to Tyana turns north round its base, and thus it commands the road for a long way. Its great height would make it an admirable signal-station: it overlooks the road through the vale to the gorge, and probably even the glen beyond Chifte-Khan, and to the north it must command a magnificent view to the second beacon-height on the lofty western spur of Hassan-Dagh (Argaios). In 1886 I climbed up to that grand castle on Argaios, and looked down to the peak of Lulon; but in 1902 I felt myself too enervated by the heat and moisture of Cilicia to attempt this steep height. Moreover, a heavy thunderstorm burst over us as we were looking up at the peak. We can hardly be mistaken, however; this must be Lulon.

And so we appeal again to the old Turk; and he tells us that there are great walls and rock-cuttings on the top of that hill, but the walls are chiefly on the north and the west sides.

Further, Ibn Khordadhbeh makes it clear that the Arab name for the great fortress here was Aç-Çafçaf. The situation of Aç-Çafçaf has always been a puzzle, because the Arab writers sometimes speak of Louloua and at other times of Aç-Çafçaf, and this seemed to prove that they were different fortresses. We now see that they are two names, Arab and Byzantine, for one place.

Another kilometre or less brings us to Kartal-Hassan-Khan. The ascent has been comparatively stiff since 56 kilometres, and the glen is narrowing again. After another kilometre we reach the point where the road to Tyana turns up to the north, passes through a gap in the hills, and disappears from view.* We keep on west for 3 miles to Sejah-ed-Din-Ulu-Kishla (" the Long Barracks of Sejah-ed-Din ").

Here at Ulu Kishla ends the pass of the Cilician Gates, for the road now enters on an open high-lying valley, nearly circular to view, in diameter about 3 or 4 miles. At the western end of the open valley is the watershed, a gentle elevation about 5440 feet above the sea. The eastern end by Ulu-Kishla is about 4840 feet high. The watershed on the north is about 4900 feet at the point where a road goes off to the Turkmen camps on the plains that lie between Eregli and Tyana. At the western watershed begins a glen leading north-west, which is perhaps the River of Tamarisks of the Arabs (Wâdi, or Nahr-at-Tarfa).

The large building which gives its name to the village, Ulu-Kishla (" the Long Barracks "), belongs to the early Turkish period. It is not a khan, as some travellers call it,† but a station for troops; and its construction must belong to the period when the defence of the pass was still important. The villagers now say it was built by Ibrahim Pasha; but when we derided this statement, a very old man was sent for to decide the question, the sole inhabitant who had survived from Ibrahim's time, and he confirmed us, to the great admiration of his compatriots. A mosque, beside the Kishla, however, may be Ibrahim's work, as Sir C. Wilson thinks, and as, if I recollect rightly, the old man declared.

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* In 1890 I came from Tyana by this road, going to Tarsus very hurriedly. It is an easy road, ascending very gently to a barely perceptible watershed which is in the gap in the hills just mentioned. In 1902 we went some distance up the Tyana road in vain search of a kilometre-stone. The railway from Kouia will enter by this path probably, and not by Ulu-Kishla.

† By a slip very rare in his singularly accurate, but unfortunately too brief, Handbook, Sir C. Wilson calls it a khan. This is literally only a slip, as he pointed out to me in 1882 on the spot that the building was not a khan. But in the preface he says that this route was written by another hand.

It is tempting to identify the Long Kishla as the site of that Camp of the King of the Romans, which Ibn Khordadhbeh describes as being at the end of the pass; but Kinneir mentions a Roman camp in the narrows near the group of milestones under Lulon, and the possibility must be acknowledged that that was the Camp meant by the Arab geographer.

Had time permitted, I should have liked to say something as to the conditions of weather in the pass, for Taurus marks the limit between the severe climate of the plateau and the hot, moist climate of the sea-plain, and, indeed, that was one of the causes which made Taurus such an important barrier between nations. But there is so much to say on this point, and so many questions hinge on it, that I must refrain. Already I have trespassed too far, and yet I have been able neither to carry out my intention of giving a fairly minute description of the road, stage by stage, such as might exhaust the subject and be permanently useful for reference, nor to give an account of the many topics that suggest themselves at every important point.

The pass ceased under the Turkish rule to have any importance as a trade route. Trebizond and Smyrna were the sea-ends of the only important trade-roads of Turkish Asia Minor. This was due to severa causes, on which time does not permit us to enter. But there has been recently a great increase of traffic on the road. We were told of lines of camels stretching almost continuously from the Gates to Tarsus and though what we actually saw fell very much short of the description, yet it was very much in excess of our experience in 1890 and 1891 Moreover, our journey took place in a very slack time, before the busy period of the year had begun.

APPENDICES.

I. TABLE OF HEIGHTS AND DISTANCES.

	Kilom. from last point.	Ramsay, 1902.	Ramsay, 1891.	Sir C. Wilson.	Major Bennet.	Colonel Stewart.	Ober humm
Konia	—	[3370]	[3370]	—	—	—	—
Eregli	—	3670	3690	3400	—	—	—
Watershed 5 miles west of Ulu-Kishla	—	5440	—	—	5230	—	—
Watershed 2 miles north-west of Ulu-Kishla	—	—	4900	—	—	—	—
Ulu-Kishla	3	4850	4830	4570	—	—	—

I. TABLE OF HEIGHTS AND DISTANCES—*continued.*

	Kilom. from last point.	Ramsay, 1902.	Ramsay, 1891.	Sir C. Wilson.	Major Bennet.	Colonel Stewart.	Oberhummer.
Junction of Roman road from Tyana to Gates	4	—	4630‡	—	—	—	–
Cheshmeli-Khan	7	—	4140	—	—	—	—
Porsukh-Deirmen	1½	—	4070	—	—	—	—
Tossun-Ali	2½	—	3800‡	3400	—	—	—
Bridge at Giaour-Sindikh	¾	—	—	—	—	—	—
Kochak bridge	3	3630	—	—	—	—	—
Chifte-Khan	3½	3240‡	3490*	3090	—	—	3543
Takhta-Keupreu	9	3010	2990‡	2800	—	—	—
Ak-Keupreu	5¼	2860	2850	—	2980	—	—
Bozanti-Khan	7	—	2680	—	2820	2750	—
Hill	2	—	2960	—	—	—	—
Bottom	1	—	2740	—	—	—	—
Aiva-Bey	5	—	3240	—	—	—	—
Tekir Khan	4	4200	—	—	—	—	4527
Tekir summit	2	4300	4240	—	—	4300	4822
The Gates	5	3760	3730	3740	—	3800	4527
Giaour Harman	4½	—	—	—	3100	3000	—
Sarishek Khan	5	—	2690	2700	—	2700	—
Mazar Oluk	6½	1990	1950	2000	2200	—	—
Tarsus	38	[70]	[70]	—	—	—	—
Adana	—	[100]	[100]	125	111	—	459
Mopsouestia	—	—	—	100	—	—	525
Eukyz-Oluk †	—	—	—	—	—	1670 †	4429
Nigde	—	—	—	3910	4100	4300	4626
Tyana (Eukyzly-Hissar) †	—	—	—	3600	—	—	4265

* This is clearly erroneous—over 200 feet too high; a thunderstorm on the mountains seems to have disordered the aneroid.

† Eukyz is an attempt to approximate to the common pronunciation of this word, which is a very common element in local names, and one which is constantly misunderstood by travellers. Eukyzly-Hissar, the modern name of Tyana, "fortress rich in cattle," is commonly misrepresented as Kilisse-Hissar, or Kiz-Hissar, or Kizli-Hissar (Kiz means "girl"). On the map here published, and in my writings on the subject, Eukyz-Oluk is spelt Ekuz-Oluk (neglecting the modification of the vowels). The height stands as 1670 in my notes of Colonel Stewart's route. I think that there is a slip on my part or on his, and that the number should be 2670. I have not been there.

NOTE.—My readings are estimated by aneroid by differences from Konia (railway measured height) and Tarsus. Numbers marked ‡ indicate a mean calculated between readings at two points in the neighbourhood. My readings were not taken at the same points on the two journeys. The estimates quoted from Sir C. Wilson (except a few which I take from his *Handbook*), Major Bennet, and Colonel Stewart have been in my note-book for a long time: I believe they are all aneroid readings, except that some of Sir C. Wilson's are calculated from boiling-point observations. Oberhummer's numbers are taken from his 'Durch Syrien und Kleinasien' (Berlin, 1898). A professional geographer, his numbers seem furthest away from the truth.

II. THE ANCIENT ITINERARIES ARE PROBABLY TO BE RESTORED AS FOLLOWS:—

Itin. Hierosolym.	Itin. Antonin.	Peutinger Table and Anonymous Ravennas.
Andabalis	Andabalis	Tyana
Tyana [xviii.]	Tyana, xv[iii.]	[Tyana, xviii.]
Faustinopolis [xxiii.]	Faustinopolis, xxiii.*	[Faustinopolis, v.]
Mut. Caena, xiii		Aquae Calidae [xiii].
Mans. Podandos, xii[i.]	Podandus, xxvi.*	Podandus, xii.
Mut. Pylae Fines Capp. et Cilic., xiiii		Fines Ciliciae, xv. (Table reads xxv.)
Mans. Mopsucrenae, xii[i.]	Mopsucrene, xxvii.	
[Mut. in] Monte = Quadriga, xii]		[Mutatio] in Monte, xxv.
Tarsus, xii	[Tarsus, xxiv.]	Tarsus, xii.
Mut. Pargais, xiii[i.]		
Adana, xiiii	[Adana, xxviii.]	Adana, xxviii.
Mopsuestia, xviii[i.]	[Mopsuestia, xviii.]	Mopsuestia, xix.
Mut. Tardequeia xv	Aegeae, xxi.	Anazarbus, xxvii.
Mans. Katabolo, xvi	Katabolo, xxiiii	Epiphania, xxx.
Mans. Baiae, xvii	Baiae, xv[i.]	Issus, xx? (Table reads xxi.)

NOTE.—The ancient authorities evidently go back to one original authority, in the form of a map, from which our extant itineraries (and lists of cities like Anonymous Ravennas and some of Ptolemy's Lists) were abridged: sometimes the itineraries follow alternative routes, as was natural when all were taken from a map. That original authority was doubtless the Roman official map. Measurements to a town off the road (*e.g.* Faustinopolis, *i.e.* Colonia Faustiniana, or Aquae Calidae) were not reckoned up to the town, but only to the nearest point on the road. Thus Faustinopolis xxiii. is reckoned from Tyana to the point on the road where a branch leads to Faustinopolis, about a mile or less distant; and the milestones, which are still preserved, stood at this point.

III. THE ARAB TOPOGRAPHY OF THE PASS (DERB-ES-SALAMA).

Tarsus		
al-Ollaik	12 miles.	Eski Tersus? Muzar?
ar-Rahwa		Mazar-Oluk? Sarishek?
al-Djawzat	12 "	Gates or Giaour Kharman.
al-Djardakoub	7 "	Tekir-summit.
al-Badhandoun	7 "	Bozanti.
Camp of King of Romans ...	10 "	Ulu-Kishla? Porsukh?
Wâdi-t'-Tarfâ	12 "	
Minâ	20 "	
River of Hiracla	12 "	Herakleia-Kybistra-Eregli.
Lake of Walia and al-Mas-kanyn		Ak Göl.
Zabarla [ancient Sidamaria]		Ambararasi.
Sidryya [ancient Sideropalos]		Sidirvar.
Borghouth [ancient Pyrgos].		Cassaba

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* xviii. in MSS.

† Parthey xvi., following some of the MSS.

‡ Words or numbers omitted in the manuscripts are put in square brackets.

IV. NOTE ON THE MAPS.

There is, as is well known, no good map or trustworthy map of Asia Minor. There is no city on the plateau whose situation is certain within several miles. In attempting to adapt route-surveys between such places as Angora and Konia, or Sivri-Hissar and Ak-Sheher, to the map, this uncertainty becomes exasperating. The most practically useful maps to the traveller in the country are the district maps of travellers like Colonel von Diest or Admiral Sprat, who delineated what they saw in the order that they saw it. But such maps are not so useful when the traveller comes to plot his own routes and fit them into the general scheme. Then the uncertainty comes in to baffle his attempt. The late Prof. H. Kiepert more than once mentioned this uncertainty to the present writer. All general maps are equally affected by it. With the means now available, this uncertainty ought now to be put an end to; but people are so much taken up with more distant and more popular enterprises that the small sum needed to do this work, so useful and (one might almost say) indispensable in the questions that must be settled in the near future, is not likely to be available.

The maps accompanying this paper partake of this uncertainty. I sent in to the Society three sketch-maps, adapted and modified in details from a map which, in its turn, had been founded almost entirely on Major Bennet's surveys in Cilicia, 1880–1882. That fundamental map was found to have various defects; some of these could be corrected, others could not without making a new map, for which the materials are not as yet available. For example, the Turkish measured kilometres showed that the scale of Major Bennet's map was very slightly smaller in the mountains than in the part south of Mazar-Oluk; this was probably due to the fact that it was based on dead reckoning by the time of a horse, and that in a given time a horse gets over a little more ground in the level country than on the rough mountain paths. But, as a whole, his map of Cilicia was much the best that I have seen.

R. Kiepert's new map was taken as a basis, and my correction embodied on that as far as possible. But for reasons given above the result cannot be considered satisfactory. The map represents no one; it is modified from Kiepert, but it is still further from what I think right.

The measurements given in Appendix I. will not be found to correspond exactly to these or to any map. They are given according to the Turkish kilometre-stones, but a slight attempt has been made to lessen the error in the stones beside Chifte-Khan, as mentioned in the paper.

When starting for this journey, I vainly tried, both in London and in Paris, to purchase a trocheameter, and the officials of the Society also tried. No one had a trocheameter ready, though many were prepared to make one. I expected that my good friend, Mr. E. Purser, manager of the Ottoman Railway, would lend me one; but when I reached Smyrna, I found that he had retired from office. There can be no doubt that, by a careful combination of the trocheameter and the Turkish measured kilometres, this road from Tarsus to Nigde might be made the basis of a greatly improved map of the eastern regions of Asia Minor, but the instrument must be ordered some months beforehand by the intending explorer.

If I have been obliged to mention the errors in the maps of the late Prof. H. Kiepert and his son Dr. R. Kiepert, I trust it is understood that I do so only for the sake of drawing attention to the urgent need of improvement in knowledge, and from no wish to depreciate or undervalue the immense services rendered under great difficulties to all students and travellers in Asia Minor by the late H. Kiepert, whose spirit and work were beyond all praise. That R. Kiepert should continue and perfect his work is the wish of every one. But if we keep up the pretence that the existing maps are good, we only deprive Kiepert of the chance of completing his work and fulfilling his honourable ambition.

Before the reading of the paper, the PRESIDENT said: We have to welcome this evening again Prof. Ramsay, from whom we had a very interesting paper on Asia Minor a short time ago. He is now going to give us an account of his labour, in Cilicia and Taurus. I call upon Prof. Ramsay to read his paper.

After the reading of the paper, the following discussion took place:—

Sir CHARLES WILSON: I think we are all much indebted to Prof. Ramsay for his most interesting paper. The paper, which will be published in the *Journal*, gives the road through the pass in great detail. I also think we must congratulate Mrs. Ramsay on the beautiful photographs which have shown upon the screen. The pass is certainly one which cannot be surpassed in picturesque beauty. There are one or two points upon which I should like to say a word. One is with regard to the course of the rivers in the plain. I think that at one time the ancient Mallos was very probably an island, and with regard to the connection between the Sarus and the Pyramus, I may mention that an old channel was followed by Colonel Bennet, who was at Adana in the early eighties. There can be no doubt that at one time the Sarus did flow into the Pyramus, and I think you will see from the map that it would be almost the only course for the river to take on its way to the sea in times long past. Then with regard to the Cilician gates, I had the greatest curiosity to see these celebrated gates when I was in Cilicia, and I travelled through them, and went on to the position taken up by Ibrahim Pasha. Coming back we took a road on the right bank of the river, and found a comparatively easy way which could be readily made passable for artillery to the west of the Gates. I remember thinking at the time that it was possibly the road followed by the army of Cyrus when he descended into the Cilician plain. Xenophon does not mention the Gates, and he certainly passed by some other road—possibly that which we followed. I do not remember any great battle at the Gate itself, but it is certainly an extraordinary feature, and the making of a cart-road through it must have been a very great work in the olden days, and one that facilitated commerce between the plateau of Asia Minor and the sea. I have always thought that the easiest pass across the Taurus was that by which the Turks took their artillery on their march to Northern Syria: it is some distance east of the Cilician Gates. But that route would not be a good one for the Baghdad railway to follow, because when you get out of the pass you find yourself in very difficult country for a railway; the hard limestone rocks present great difficulties, and I think the line the Germans appear to have adopted is the best under the circumstances. It is the easiest route, although it has its difficulties, and it is the route which will provide the greatest amount of traffic for the railway. When I was in Asia Minor I took great interest in the lines of railway, and it may perhaps interest you to hear the origin of the railway from Mersina to Adana. There was a progressive governor of Cilicia at that time, and I spoke to him about the desirability of having a railway to carry the produce of the great plain to the sea. He concurred, and asked Colonel Bennet, who was at that time vice-consul at Adana, to obtain the requisite information. An estimate and plan for a metregauge railway were obtained for the governor, but when he sent it on to Constantinople, he was told that he must either have a broad-gauge railway or none at all. The consequence was the construction of the present broad-gauge line, which, I believe, has never quite paid its expenses, or only just paid them. Prof. Ramsay alluded to the great difference between eastern and western Cilicia in olden days, and it is a curious fact that the same distinction between the two plains exists at the present day. The great alluvial plain is well cultivated; and one reason for its high state of cultivation is, that there has been a large migration of the curious people, Ansarîyeh, alluded to in one of Disraeli's novels, who are extremely good cultivators and gardeners. They have come down in large numbers and have settled on the plain. Eastern Cilicia, on the other hand, is, or rather was some time ago, entirely the home of the nomads, who come down in great numbers from the high country to the north to pass the winter. It is a most interesting sight in winter to see the whole of this portion of the plain covered by the animals, the sheep, the camels, and oxen, that have come down from the higher country. Very little of that portion of the plain is cultivated, but it is quite as fertile or nearly so as the plain of western Cilicia. Prof. Ramsay also alluded to the English railway from Smyrna, which is now cut off from the interior by the German railway. It is curious that this question of Smyrna and Constantinople is much the same as that in Egypt between Alexandria and Suakin. In the olden days the Pasha of Egypt would never allow a railway to be made to Suakin, because he wished to bring all traffic down to Alexandria, and thus throw money into the hands of the Alexandrian merchants. It was one of General Gordon's pet schemes to make a railway to Suakin, but he was unable to get the Egyptian Government to consent. Now, the only railway, that to Khartum, was made for military purposes, but those military purposes having been served, the railway to Suakin is about to be commenced. The point is this, that commerce will always find its way to the nearest outlet by the shortest land-passage, and it is only a case of waiting a certain number of years for all the commerce to go to Smyrna instead of Constantinople. I believe the German company has several times tried to purchase the English railway, and if they ever get possession of it the trade will probably come down to Smyrna. I can only say what pleasure it has given to me to hear Prof. Ramsay's paper this evening. There is no one who is such an authority upon the subject.

Rev. H. S. Cronin: I am afraid I can only say what very great pleasure it has been to me to hear Prof. Ramsay, and at the same time to express my gratitude to him for allowing me to accompany him on one occasion. All that I can add is, the eastern part of Asia Minor being unfamiliar to me, that so strong was the wish to prevent trade coming down to Constantinople instead of Smyrna, that there is no proper junction at all. There is a separate station for the Smyrna railway, and another station for the Constantinople railway, and the railways which have been put down between the two have been pulled up. I wish I could add more to the discussion, but I was absolutely unprepared for the possibility of having to take part in it.

Rev. A. C. Headlam: I have some difficulty in addressing the meeting, because it is now nearly thirteen years since I was in that part of the country, and I never, unfortunately, had the privilege of passing through the Cilician Gates. I never went further than Bozanti, but I will try and mention one or two things, to the north of the Gate, of interest. You will see at the corner of the map reference to a place called Eregli. That recalls certain reminiscences. Eregli is a very interesting place on one of the roads between the head of the pass and Konia. It is an extremely fertile valley—in fact, one of the most fertile portions of Asia

Minor. It owes its fertility to the river, which was always impressed upon the popular mind as being the gift of the gods. It is a river which bursts fully grown from this side of the hill, which flows for about 30 miles through the valley and then disappears into the ground. After many arduous days of travel through the mountains, we arrived at Eregli, which seemed a land of plenty. Prof. Ramsey stayed behind in the town, and sent Mr. Hogarth and myself to the source of the river, in order to make an investigation of a very interesting Hittite monument which is there. I believe I must not say Hittite any longer. At any rate, at the source of the river there is an exceedingly interesting monument representing the king of the country offering a bunch of grapes and a sheaf of corn to the gods, and accompanied by those symbols which may or may not be deciphered. Prof. Ramsay stayed behind in Eregli, and we hoped he would replenish our larder, and we had agreed to meet him at some tents about 4 or 5 miles out of the city. We arrived there after a very hard day's work, late in the afternoon, and expected to find our tents pitched and a comfortable meal being cooked. Prof. Ramsay arrived at the same time as ourselves, and we discovered that his devotion to archæology was so great that he had spent the whole of the afternoon in deciphering Latin inscriptions, and had completely forgotten to order any food. The other place I should like to refer to is Bulghar Maden, which we visited in company with Mr. Hogarth, and again for the sake of copying a very interesting inscription. Bulghar Maden is a small town high up in the mountains, and is the site of some silver-mines which are still being worked, and which may be very productive for all we know. The whole of that country was famous from the very earliest times for its silver, and its mines have been worked ever since. A third district to which I should like to refer is the road starting from Bozanti and going north. We went through that road, and it struck me at the time as being an extremely attractive upland valley, the route running between lofty mountains with a rich well-watered country and with many streams in it. It has always seemed to me, ever since I travelled there, that Asia Minor is a place of extreme interest. It is of great interest from an archæological point of view, and also politically. Asia Minor has suffered for many generations under very bad government, but I believe that under the native Anatolian, with his physical strength and his power of endurance, it has the capacity of being the backbone of a very great power. He is certainly the backbone at the present time of the Turkish army, and under good government he might develop that country so as to make it exceedingly prosperous and very rich. In old days there was a city wherever a village is now, and with a little irrigation almost the whole of the country might be as fertile as some of the districts where nature has been more prodigal. I have been very much interested in Prof. Ramsay's paper.

The President: Those present at this meeting must, I feel sure, have felt great interest in listening to the description of such a country as Cilicia from so high an authority as Prof. Ramsay. It is extraordinary what historical interest attaches to this corner of Asia Minor. In describing it Prof. Ramsay has had to allude to many great historical events—to the march of Alexander before the battle of Issus, to the march of Septimus Severus against Pescennius Niger, to the alterations made in the course of the rivers by the Emperor Justinian, to the extraordinary change made by the knowledge and industry of the Romans and Greeks in converting a hideous swamp into a famous harbour. All these points show how interesting and important a knowledge of the physical geography of a country at various times is in the study of history, and I think, perhaps, the most interesting part of Prof. Ramsay's paper is the description of those famous historical Cilician Gates. The interest was much enhanced by the beautiful way in which his paper was illustrated by the photographs. I am sure you will all wish to pass a unanimous vote of thanks to Prof. Ramsay for his most interesting paper.

A SCHEME OF GEOGRAPHY.

By Prof. W. M. DAVIS.

THERE is a certain profit in looking forward to the time when the Earth and its inhabitants shall have been so well studied that if all then known about them were put in print, the volumes thus formed would include the whole content of geography. The material there gathered might be arranged following either one of two plans. According to one plan, everything about a certain country would be brought together; this would make a treatise on regional geography. According to the other plan, all things of the same kind would be brought together; this would constitute a treatise on systematic geography. Under either plan, convenience would be served by adopting some reasonable scheme that might be invented for the arrangement of the parts into which the subject might be divided. Under regional geography, for example, the arrangement might be according to the continents and their political subdivisions. Under systematic geography, the arrangement might follow the usual order of globe, atmosphere, oceans, lands, inhabitants. Under each plan, use would be made of the other as a secondary guide. All the items under Mexico in a regional treatise should follow a systematic order of presentation; while all examples of a certain kind of lakes in a systematic treatise should follow a regional order of presentation.

A complete geographical treatise, regional or systematic, would be inconveniently bulky. Abbreviated editions would be in demand, and they might be abbreviated in several ways. In one way, unimportant or inconspicuous items would be omitted, and important or conspicuous items retained, wherever or whatever they might be. In another way, remote items might be omitted and home items retained. In a third way, difficult items would be omitted and elementary items retained. Thus handbooks and school books would be developed.

There can be little doubt that the abbreviated or simplified editions would gain in value with the approach to completeness of the treatises on which they were based, as well as with the competence of their authors. A hundred years ago the best geographies were necessarily silent concerning the then extensive unexplored parts of the world. To-day the best geographies contain a much larger body of information than their predecessors, but they are still silent concerning many of the more advanced problems of geography. A hundred years hence there may be still much to learn, but great progress will by that time have been made in the more philosophical phases of geography, to which attention is not yet sufficiently directed. It is especially with the object of calling attention to some of these phases that this note is written.

The direction in which geographical progress is to be made in the next hundred years may perhaps be forecast from the direction of progress in the last hundred. Geography used to be a "study of the Earth and its inhabitants." Items were brought together in great number; they were described more or less empirically; but there was no sufficient effort made to explain and to correlate them. Correlation was greatly promoted by Ritter and his followers. Geography then became, not simply a study of independent items, but a study of the Earth and its inhabitants in their mutual relations. With the advance of science in general, the description of geographical items became more and more explanatory; but progress in the larger problems of correlation was retarded for half a century by the prevalence of a teleological philosophy, and until this was replaced by the doctrine of evolution, the modern phase of geography could not be reached.

In its present modern phase, geography is essentially concerned with the rational correlation of the items that fall under its two parts: on the one hand, the items of inorganic conditions that constitute the physical environment of living forms; and on the other hand, the items of organic response made by living forms to their environment. The first of these two parts is commonly called physical geography. In the United States this term is coming to be condensed into physiography.* The second part has no name; it includes certain phases of political and commercial geography, and it goes much further than either, because it is concerned with all forms of life instead of only with man and what is useful to him. It will here be called ontography; the main root of the word corresponding to that of palæontology, and the termination agreeing with that of physiography and of geography.

Thus understood, geography is concerned with the combination of physiography and ontography—that is, with the correlation between inorganic environment and organic response. Individual items, such as the course of an ocean current, the path of a valley, the area of a forest, the population of a village, fall under the physiographic or the ontographic division of the subject, and must there be studied as carefully and rationally as possible; but they will fail to attain a truly geographic quality as long as they are treated independently, instead of being brought into proper correlation with their fellows. The physiographic items, regarded as elements of controlling environment, must be associated in thorough-going geographical work with the ontographic responses that they have evoked. The ontographic items, regarded as responses to environing conditions, must be associated with the physiographic controls by which they have been governed. The course of a current will affect the distribution of living forms or the lines of navigation; the path of a valley will determine the location of roads and villages; the area of a forest is the response to land form, climate, and soil; the population of a village depends on many environing factors. No full measure of geographical treatment will be reached by the student who restricts his work either to the inorganic or to the organic half of the subject. Those who wish to train themselves to be fully equipped geographers should gain not only the capacity, but also the habit of giving due attention to ontography and physiography combined. The best geographical works to-day clearly enough exhibit the beginning of this double consideration of their subject, but they usually fall short of carrying the treatment thoroughly and uniformly over all aspects of the subject, and they commonly fail to show that their plan of treatment has been adopted in accordance with a sufficiently comprehensive view of geography as a whole. It is still usual in the best modern books to find many facts described as if they were lonesome individual occurrences instead of members of a recognized class, and

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* Thus employed, physiography is not directly concerned with astronomy and geology, or with physics and chemistry, as it has come to be, unfortunately, in my opinion, in England.

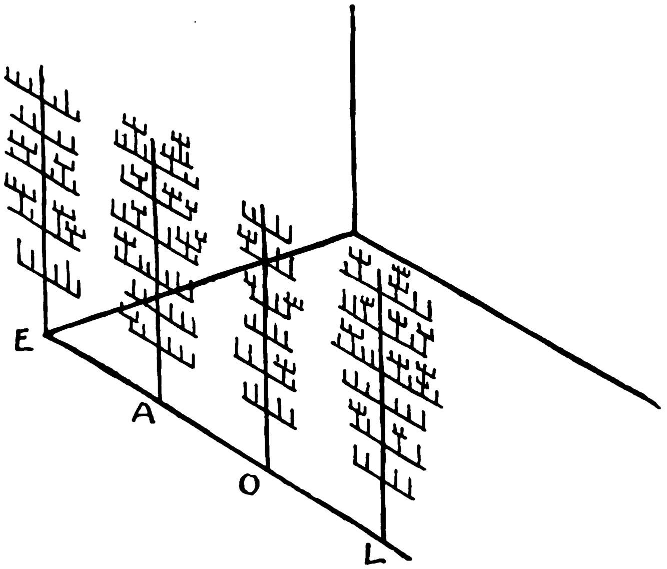


FIG. 1.

to find their description closed before they have been systematically correlated with their responses or their controls.

The quality of geography as a whole may be presented and emphasized by a simple graphic device that experience has shown to have some value. Imagine the four frameworks, E, A, O, L, Fig. 1, to stand in a vertical plane over the line EL, and to contain compartments for all the topics of systematic physiography under the larger headings of the Earth as a globe, the atmosphere, the oceans, and the lands. The compartments may be taken to represent types, with respect to which actual examples are classified. It may be briefly pointed out, although it is not intended to delay here in explaining all the practical value of this part of the device, that the observer is greatly aided in his work if he carries mentally into his field of study a well-arranged framework on which the types that embody the results of all previous investigations are carefully defined and arranged; for there can be no question that the habitual treatment of every observed physiographic item as far as possible as a member of a known class, is a most practical and serviceable aid in field observation and record. The framework must not, however, be imagined to represent a rigid and unchangeable scheme; it should be elastic and adjustable, constantly modified in response to accepted suggestions for improvement as investigation progresses.

Physiography is to-day relatively well developed; and the classification of its parts representable in a framework is fairly well advanced, although, for that matter, there is yet by no means so general an agreement among physiographers with respect to the systematic subdivision and arrangement of the items with which they have to deal as there is among botanists and zoologists with respect to the systematic classification of plants and animals. Some physiographers, for example, treat rivers and oceans in one division apart from the lands; others treat oceans and coasts together, before the lands have been studied; but both these plans are fortunately unusual. Ontography, on the other hand, has hardly any recognized scheme of treatment; it has still to be systematically studied. The framework on the further side of Fig. 2, by which a classification of organic responses is here roughly indicated, must therefore be taken for the present as suggesting what may yet be done rather than as representing what has already been done in this direction.

Even the limits of ontography are not yet agreed upon, and in considering with historians, zoologists, and botanists how far this division of geography may be reasonably extended, it is sometimes the case that one encounters certain indications of jealousy and accusations of trespass. Here, however, as in other sciences, it is not so much the object studied as the relation in which it is studied that determines its place in a scientific classification. The same object may be studied in its varied relations under several different sciences. Surely history, zoology, and botany make use of geographical items so often that there can be little ground of just complaint if geography finds occasion to examine facts that are commonly associated with these other divisions of knowledge. The most reasonable method of determining the limits of ontography seems to be the following: Select certain examples of undoubtedly ontographic facts, and then, under the principle of continuity, follow the lead of the classes to which these facts belong as far as they can be traced; otherwise the limits must be arbitrary or conventional. There will be thus found certain facts that are indisputably and centrally ontographic, while others are peripheral, and are more or less shared with other sciences; but in the latter case, all the sciences concerned are equally trespassers. These abstract considerations may be illustrated to advantage by some concrete examples.

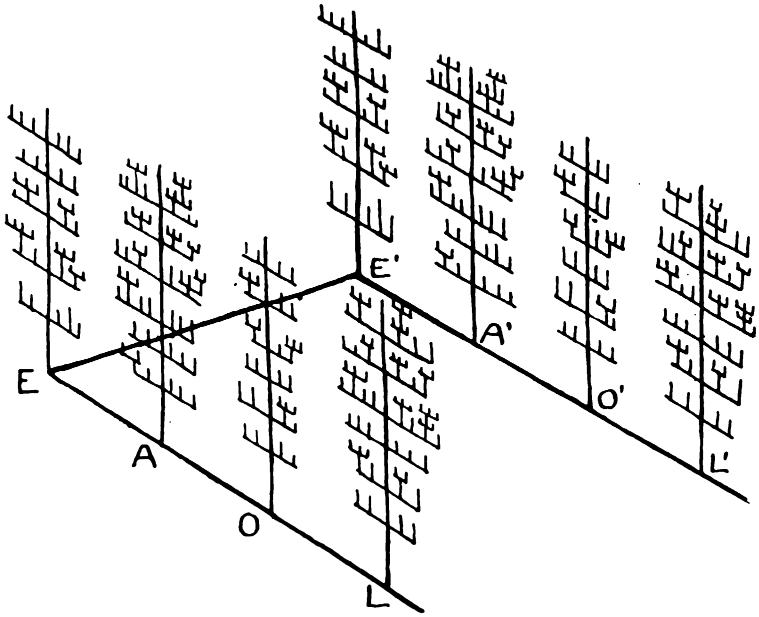


FIG. 2.

The location of a village at the head of a bay on the sea-coast must be considered by every one to be a geographical item, and according to the plan here presented it will fall under the ontographic half of the subject. In old-fashioned geography, such an item would have been empirically stated, without explanation of its meaning; in more modern geography, it would be rationally described as an example of a class of responses in which man's way of doing things is determined by his physiographic surroundings. Need having arisen of interchange between land and sea (this itself being an important ontographic matter), the coast-line gains importance because it separates two kinds of activities; and protected points on the shore-line, such as bay heads, become of exceptional importance, because here the interchange between the two kinds of activities can be effected with the least difficulty. Now, the essential quality of this item is that certain organic inhabitants of the Earth have found it to their advantage to be guided in certain actions by the conditions of their inorganic environment. Hence, under the principle of continuity, every other item in which an organism is thus guided to act in certain ways is also of an essentially ontographic quality. It matters not whether the organism is man, animal, or plant, whether the action is conscious or unconscious, whether it is of great or little importance; the essential feature is that the item must involve a response or reaction of organism to environment. It is only by adopting an arbitrary limit for ontography, and hence also for geography, that anything narrower than this broad definition can be regarded as indicating its field.

The whole content of ontography, thus broadly defined, is not known, because its field has not yet been carefully examined; but enough is already known to show that the subject is of great and varied interest. It may be reviewed in two ways: all kinds of items found in the physiographic framework may be examined as to their responses in the organic world; or all kinds of organisms may be examined to see how far their structures, actions, and distribution are responses to physiographic controls. For example, in response to the important physiographic control of gravity, one finds the development of dorsal and ventral structures in many animals; those which escape this control are the minute organisms that are wafted about in the atmosphere, and the jelly-like organisms that float indifferently in one attitude or another in water. Again, one finds many details of bony structure and muscular arrangement adapted to support the body against the pull of its weight. The habit of building walls vertical and of grading railroads nearly horizontal come under the same control. Even language is affected indirectly, as in such adjectives as grave and upright, in their figurative meanings. On the other hand, one finds in the growth of trees the responses to many controls—to gravity and the search for ground water in the growth of the roots, to gravity and the search for light and air in the growth of the stem, to form of land surface and depth and character of soil as well as to various elements of climate in the determination of distribution.

It is evident that in most cases the responses above mentioned are not the result of the immediate adjustment of organism to environment, but of a gradual adjustment through long periods of past time, perpetuated through inheritance, provided the controlling conditions and need of adjustment still persist. The use of oxygen in respiration, universal in all plants and animals, is a case in point. This habit must be taken as indicating the presence of free oxygen in the ocean (dissolved) or in the atmosphere since the earliest geological periods from which fossils are preserved; the habit persists because the need and the opportunity still endure. The fur of many land mammals is a response to climatic controls; but in the marine mammals that are in all probability descended from fur-bearing ancestors, the fur is replaced by blubber. Examples of more immediate adjustment are chiefly found in actions, as when horses and cattle on the western semi-arid plains of the United States wear paths from pasturing uplands to watering-places in the valleys, and yet here, as before, habit formed through long inheritance is the mainspring of action.

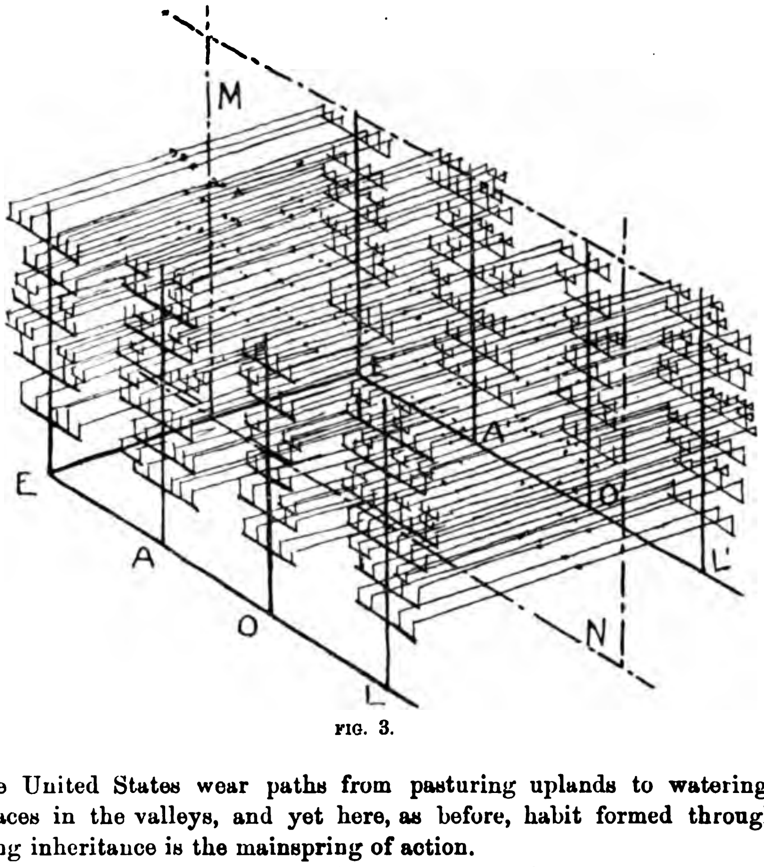


FIG. 3.

The classification employed in the ontographic framework may, in view of what has now been said, be imagined to follow either one of two plans. In one plan, all the responses to one kind of control are gathered in a single compartment, and there would be as many ontographic as physiographic compartments; this plan is followed in Fig. 2. In the other plan, each compartment would correspond to a kind of organism, and there would be as many compartments as might be needed to contain the subdivisions of the vegetable and animal kingdoms. Whichever plan is adopted, there can be little doubt that when ontography is as well developed as physiography, geography will be greatly advanced. That stage of the development of our subject may be represented in Fig. 3, in which the correlation of physiographic and ontographic items is indicated by lines that stretch across from one framework to the other, the first of the above-mentioned two plans for ontographic classification being here again illustrated. The conscious recognition and discussion of the correlations thus indicated graphically by the cross-lines is indispensable for the full development of modern geography.

It should be noted in passing, but for the present only in the briefest manner, that there are innumerable correlations to be found also among the items of each framework, considered alone. For example, London markets are to-day supplied with meat products from Argentina and Australia, where herds of cattle and flocks of sheep find cheap pasture on broad plains fit for few other uses than grazing: these are correlations among items on the ontographic framework. On the other hand, the cliffs of Cornwall result from the interaction of waves driven by winds excited by sunshine and of currents involved in tides excited by lunar attraction, on the rocky structures exposed along the present coast-line by crustal movements. Again, in a maturely dissected region, such as the Piedmont belt of North Carolina, one may recognize the wonderfully delicate interdependence of hillside slopes, soil creep, stream wash, and river work that is involved in the thoroughly organized condition of the drainage systems there established. Both these examples exhibit correlations of items on the physiographic framework. None of these correlations are, however, shown in the diagrams, for fear of too great a confusion of lines. With this digression, we may return to the consideration of Fig. 3.

Imagine now a vertical plane, MN, parallel to the planes of the two frameworks and midway between them. This new plane will be intersected by all the cross-lines of correlation, and the summary of all the points of intersection may be taken to exhibit the whole content of systematic geography. The plane may be shifted towards one or the other framework, if it is desired to give greater emphasis to one or to the other part of geography, but the well-balanced geographer will doubtless prefer to hold the plane in a midway position, as here indicated. In case the biological classification of ontographic items were adopted, the lines of correlation would not be parallel; a group of lines would radiate from each kind of physiographic control in the nearer framework to all of its ontographic responses, and various lines from numerous kinds of controls would be focussed on the kind of organism in the further framework that responded to them.

It was stated above that this graphic device has been found by experience to have some value in indicating the compound nature of geography, as it is here defined, and in illustrating the relation of its parts. It has a further value, namely, an aid in the practical analysis of a geographer's work. If, in the course of exploration or other study, an item of physiographic nature is found, the geographer must at once seek to place it in its proper relation to all other physiographic items, and to discover all the ontographic responses that it has excited. If an ontographic item is discovered, its physiographic controls must be sought for, and the correlations between the two must be studied out. This may seem so simple, so manifest, that it is hardly worth the saying; yet if any standard work on geography is examined and analyzed, it will be found far from complete in the sense of completeness here indicated. The work will undoubtedly give, more or less explicitly, many examples of correlation between controlling environment and responding organism, and it will thus confirm more or less clearly the compound nature of geography here exposed; but it will be only by way of rare exception that both phases of the subject are systematically presented, and that the correlations between them are consciously and completely analyzed. Exploration, in so far as matters of occurrence and location are concerned, has now been well advanced; exploration, in so far as thorough analysis of cause and effect is concerned, still affords plentiful opportunity for the investigator. There can be little question that studious observation and thorough record will be greatly aided when some such method of analysis as is here indicated shall have become familiar and habitual.

A few illustrations may be given to exhibit the breadth of geography, when it is expanded by the due consideration of its many parts. One is taken from an account of the oasis of Souf, in the Algerian Sahara, by Brunhes of Freibourg. This observer points out a relation between the sandy surface of the oasis and the character of the people as follows: every walking animal leaves its track in the sand, and from this follows an extraordinary skill on the part of the natives in tracking men and beasts; individual footprints can be recognized and followed through a confusion of crossing trails, where the untrained eye of a European would be unable to distinguish one track from another. As a result, theft is said to be less common in the sandy Souf than in the stony oases; the thief is so surely tracked and found that thieving is unprofitable.

Another example is furnished by Lugéon of Lausanne, who describes the relation between villages and alluvial fans in the higher valleys of the Alps. The fans offer the best sites for occupation; nearly every fan has its own village, each with its own organization, and the distribution of villages depends closely on the distribution of fans. As most of the fans are of small area, most of the villages must be of small size. An earlier writer has instanced the development of these small village communities as illustrating the innate spirit of independence in the Swiss people; but Lugéon points out that small communities necessarily result from the small fans, and then aptly inquires whether the spirit of independence is not more probably a consequence than a cause of the subdivision of village communities.

Instances of this sort might be given in great number. **Baku,** the petroleum port on the arid shores of the Caspian, has rapidly grown to a population of something like 150,000 souls in consequence of the discovery and exploitation of rock oil near by. So large a population needs an abundant water-supply, not easily to be had in a region of so dry a climate as that of western Asia. Water could be brought at a considerable expense from a river over 50 miles away, but capitalists hesitate to undertake the construction of so long an aqueduct for a city whose population will mostly move away when the oil-wells give out; hence at present the local supply from wells of unsatisfactory quality is supplemented by distillation from the brackish Caspian, oil fuel being very cheap, and an ingenious system of boiling and condensation producing four pounds of distilled water for one pound of fuel. Nowhere else in the world is a distillery run on so large a scale and with so temperate an object! And who shall say that Baku's rapid growth and uncertain life, as well as its peculiar water-supply, are not ontographic items?

It is not intended to assert that all the examples of cause and consequence that might be given are established beyond dispute, but rather that they show the importance of making a thorough collection, a careful analysis, and a systematic classification of all such examples in order to carry forward the development of geography and to discover its entire content. Errors may evidently be made in speculations of this kind; for example, it does not seem safe to follow the statement of a famous geographer to the effect that the (supposed) taciturnity of the American Indian resulted from the darkness of the forest in which he lived. It is on the careful analysis of abundant observations, rather than on the refusal to speculate as to cause and consequence, that geography will thrive.

It is desirable that geography should be presented even to beginners as a subject involving the correlation of physiographic and ontographic items. When the globular form of the Earth is taught, that is the time to point out how largely the modern development of commerce results from the nearly level form that a globe alone possesses. When the size of the Earth is taught, that is the time for telling about the effects of its size in isolating savage races, and thus producing differences of language and customs, as well as for showing how greatly modern means of transportation and communication have overcome the earlier effects of isolation. With the form and rotation of the Earth there should be immediately associated the modern habit of laying out the boundaries of unsurveyed territories, as in North America, Australia, and Africa, along the meridians and parallels; and so on through the whole subject. The young student may thus be thoroughly infected with the idea of correlation, and from such an introduction to geography he may more probably contribute afterwards to its advancement than if he had been taught in the old-fashioned empirical way, or in the more modern method of imperfectly developed correlation.

The most important steps towards the fuller development of geography therefore seem to be, first, the formation of the habit of looking for correlations of physiographic and ontographic items; and, second, the development of a well-considered classification of all items, physiographic and ontographic, so that all may be considered in reference to their fellows.

A JOURNEY ACROSS THE NYIKA PLATEAU.

By J. McCLOUNIE, Head of the Scientific Department, British Central Africa Protectorate.

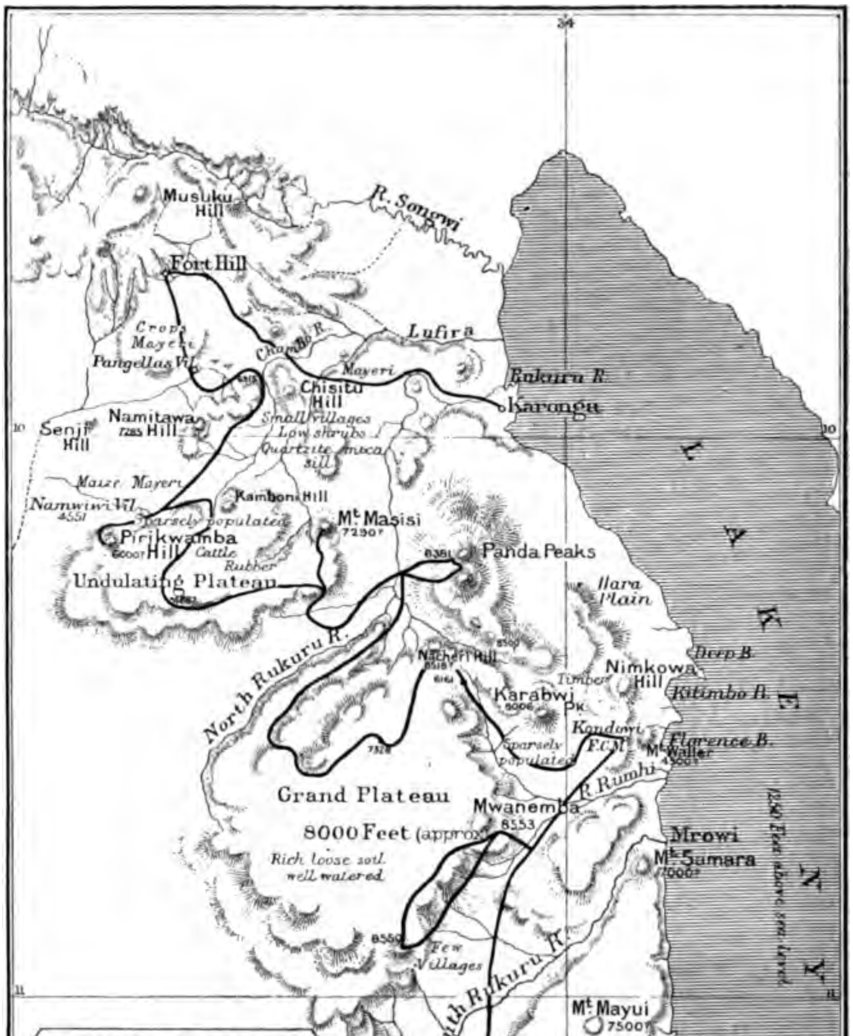
The following pages describe a journey from Karonga, *viâ* Fort Hill, to Nkata bay, undertaken with the object, firstly, of obtaining a precise knowledge of the north-western portion of Nyasaland and its agricultural prospects; and, secondly, of making botanical and zoological collections. The journey was to be made over little-known and sparsely inhabited country, and it was therefore thought advisable to halt only one day, or at most two, at any place, because of the question of food for native carriers, and the possibility of their deserting in any awkward situation. These reasons, therefore, did not allow of extensive collections being made. No information of the country to be traversed could be obtained beforehand, and only from native report could I learn that it was sparsely populated and mountainous.

In order that the record of the journey might be more useful, I endeavoured to make a map of the country by prismatic compass and plane-table survey. Being without astronomical instruments, sextant, etc., I was unable to fix by latitude any of the important positions, hence the accompanying map is only approximately correct. The hazy nature of the atmosphere at this season of the year rendered distances "by estimation" very liable to be in error; this, however, I sought to correct as far as possible by marching, but this is also a source of error. The heights of the mountains and other places I ascertained by boiling-point thermometer (tables from 'Hints to Travellers'), and by the same instrument the height of Lake Nyasa I reckoned to be 1251 feet above sea-level. On existing maps it is given as 1590 feet, but by what method arrived at I cannot say. It is unfortunate that as yet the exact altitude of Chiromo (at the junction of the Ruo and Shire rivers) has not been fixed by spirit-levelling from Chinde. A recent railway survey assumed that Chiromo was 500 feet above sea-level, and by spirit-levelling thence placed the height of the barometer at Zomba observatory as 3323 feet, which, on continuation, gave the height of Lake Nyasa as nearly 1600 feet. A late boundary commission passing through Chiromo fixed its height at 125 feet above sea-level, and by applying the reduction (−375 feet) to the B.M. near Zomba, the height of the barometer is given as 2948 feet; whereas by boiling-point thermometer it comes out as 2960 feet, a difference of 12 feet only, which strengthens my figures of 1251 feet as the correct altitude of Lake Nyasa, and also the heights determined throughout the journey, every precaution being taken to ensure correct readings.

Leaving Karonga on August 28, my intention was to proceed inland due west; but as the natives of this district are unsuitable as porters for long journeys, it was advisable that I should go to Fort Hill, where carriers are much stronger and able to travel on protracted journeys over hilly country.

Karonga was left at 10 a.m., and the Mpata Hill resting-place reached early in the afternoon. The river Rukuru, about ankle-deep and 30 feet wide, was crossed nearly halfway from Karonga, the Stevenson road again touching the left bank of this stream at a curve adjacent to the south-east slopes of Mpata. I ascended the small hill on the right of the road to see the nature of the country to the west, and to obtain rays to Masisi mountain; but the hazy atmosphere rendered this anything but satisfactory, making distant objects indistinct and near hills appear erroneously far off. It was from this cause impossible to fix a satisfactory base-line from which to commence plane-table work. Botanical specimens were unobtainable in this extremely dry and parched region owing to it having recently been burned, the only green vegetation visible being the banana groves of the natives, the fruit from which, together with milk, forms the chief means of subsistence. Notwithstanding the aridness of the country, cattle here were in splendid condition and numerous. The journey was continued towards Fort Hill, camp being pitched *en route* at the Lufira stream, which has a good flow of clear water. From this point the hitherto well-engineered Stevenson road becomes more difficult, and appears not to have been so well surveyed.. I understand that, through the illness and death of the original surveyors, the completion of the road was deferred to a later date.

From the Lufira stream to the summit of Chambo hill the country is well wooded, has good grazing-ground, is undulating, with generally a rich dark soil. In the dry seasons the rainfall may be deficient, but the average precipitation probably ranges from 50 to 70 inches annually. The general elevation of the country is about 2800 feet above sea-level, with ridges running up to about 4000 feet, while its principal mountain,


NYIKA PLATEAU
From a prismatic compass & plane table sketch
by
J. McCLOUNIE
Scale of Miles
0 10 20 30
Nat. scale 1:1500000 or 23.7 miles = 1 inch
Route
34
10
11
R. Songwi
Musuku Hill
Fort Hill
Crops Mayeri
Pangellas Vil.
Chambo R.
Lufira
Mayeri
Rukuru R.
Karonga
Chisitu Hill
Namitawa 7265 Hill
Senji Hill
Small villages
Low shrubs
Quartzite mica sill
Maize Mayeri
Namwiwi Vil. 4551
Kamboni Hill
Sparsely populated
Mt. Masisi 7250?
Pirikwamba 6000? Hill
Cattle
Rubber
Undulating Plateau
Panda Peaks
Ilara Plain
North Rukuru R.
Nachari Hill
8500
Timber
Nimkowa Hill
Deep B.
Kitimbo R.
Karabwi Pk.
Kondowi F.C.M.
Sparsely populated
Florence B.
Mt. Waller 4500?
R. Rumhi
Grand Plateau
8000 Feet (approx)
Mwanemba 8553
Rich loose soil well watered
Mrowi
Mt. Sumara 7000?
1550 Feet above sea level
Few Villages
South Rukuru R.
Mt. Mayui 7500?
Mt. Choma? 5500
Mt. Jakwa
Momberas Country
Chinonga
Ekendeni F.C.M.
Mt. Kuningini 5000?
Large population
Cattle
Lunyangwa R.
R. Limpasi
Mt. Mbwabwa 4800?
Good timber
Coffee land
Nkata B.
LAKE NYASSA]

"Chisitu," may touch 5500 feet. The Chambo stream, which rises from the southern slopes of the Namitawa range, and flows along the northern slopes of Chisitu, was dry at the crossing, but, as will be seen later, had plenty of water a few miles higher up. Fort Hill was reached in two and a half days from Karonga. The station is situated on what is termed the "Nyasa-Tanganyika" plateau. The Musuku range of mountains is about 12 miles to the north of the station, and rises to some 7500 feet.

Obtaining sufficient porters from Mr. Farnill-Scott, the collector at Fort Hill, I left his hospitable roof and proceeded due south towards the Namitawa mountains, which appeared about 20 miles away. The general level of this plateau (judged from the boiling-point thermometer height of 3765 feet for the collector's house) is some 3700 feet, and in the neighbourhood of my route was very sparsely populated. A few huts of very primitive construction were passed, and after three and a half hours' travelling over thinly timbered land the village of Chief Pangella was reached, on the banks of the upper waters of the Loangwa. Surrounded by a stout stockade, his hundred odd people exist in huts built closely together, some of which were scarcely distinguishable from those of the cattle. The land here was cut deeply by the annual floods of the Loangwa, and revealed rich soil to a depth of 10 feet. The principal cereal grown by these people is named "ma'eri," or "maweri" (possibly *Panicum miliaceum*), and is largely used in the brewing of beer, as well as in the making of food in the form of porridge. In cultivation it is sown broadcast on circular pieces of land, sometimes one acre or two acres in extent, surrounded by a fence against the intrusion of game. Heavily timbered ground is selected on which to grow the crop; the branches of the trees are lopped off about 6 feet from the ground, and all laid thickly thereon to dry, and ultimately to be burned as the rainy season approaches. Many trees in the vicinity of these gardens are thus denuded of their branches for the cultivation of this crop. It is a method of ancient date, as evidenced by the trees all over the plateau having at one time received similar treatment.

Continuing the journey, Namitawa was reached in three hours. The influence of the 7000-feet peaks is apparent in the rank vegetation at the base. Large "mbemba" trees laden with a rather tasteless fruit similar to the Musuku are plentiful, and had there been more streams of the size of the Loangwa, this part of the country would have provided excellent land for the cultivation of coffee. As it is, there are many miles of suitable land, extending from the base of Namitawa to Chisitu and its neighbourhood. The massive rock formation of Namitawa resembles Mount Mlanje (in the Shire highlands) in its grey granite, cut by deep ravines, from which at this period of the year trickle streamlets, absorbed by the parched land before they run a mile towards the plain. Similarly with the Loangwa, in which, even at Pangella's village, there seemed to be less flow than there was at the foot of the mountain.

After pitching my camp beside one of these streams, I ascended a precipitous spur of the mountain to ascertain the nature of the summit, and make collections. Striking objects amongst the rocks were some examples of old and scraggy *Dissotis*, which carried a profusion of dark purple flowers, their bright yellow anthers resembling the long legs of the gaudy purple mason wasp, or "hornet" as it is commonly named. Stunted wind-blown specimens of *Vellozias* were plentiful, naked of leaves and flowers, and it is difficult to imagine how it is that, with the rains, such shrubs can produce such delicate white wax-like flowers, or, as in the small-growing species, the tufts of which are rarely over a foot high, can burst into a mass of pale purple flowers as soon as the atmosphere becomes humid. The common aloes were also plentiful. The summit was reached after 3½ hours' climbing, and was found to be of no great extent, and broken by deep rocky gorges.

It is regrettable that the majority of the photographs taken on the journey have not been a success. Every precaution was exercised in exposing, packing, and developing, but many of the plates turned out splotchy, streaky, and unsatisfactory; it is possible that they may have suffered from the heat, which one day would be extreme, while the next day, from a change of altitude, frost would be experienced.

The Loangwa flows north at this point, thence west and south-west. The altitude of the summit of Namitawa (by boiling-point thermometer) was 7285 feet. A higher point was seen a short distance off, but separated by a deep ravine; I estimated that it was nearly 150 feet higher. After taking rays to important hills on the line of march, I again descended the spur to camp, next day proceeding round about 5 miles to the Loangwa, where I stayed two days. Several rodents were secured here, also some botanical and zoological specimens.

The carriers, being near their homes, were dissatisfied, so it was advisable to get farther from Fort Hill as quickly as possible. A few huts were passed on the way to Chisutu, and the native supplied plenty of fresh cow's milk and other produce.

Much mica sparkles on the ground all round Namitawa, and there appears to be a fair proportion of quartz in the soil. The stream Chambo was seen when the east spur of Namitawa was rounded, and I followed up its course some distance to a village which would be due south of my camp at the Loangwa. Arriving at this village about 1.30 p.m., I decided to climb a prominent peak of Namitawa. This was an easy ascent, up a native path, and the height obtained was 6945 feet. In a damp corner of this hill at 6700 feet the flora resembles that of Mlanje at 5800 feet, with *Hypericums*, *Dissotis*, and aloes. The country hereabout had all been burned recently, and was not productive of many good botanical specimens. The hunters, however, secured some interesting birds.

Starting next morning for two hills to the south and south-west, which appeared to be on the edge of a small plateau, we took a path leading through a maze of undergrowth of heaths and short shrubs. The soil was gravelly and hard, with at intervals swift-running streams from the slopes of Namitawa flowing to the Chambo or Lufira.

We marched past Kamboni hill, and due west the village of Namwiwi was reached, one of the most filthy villages I have ever seen. The population is perhaps 200 or 300 all told, and exceptionally dirty in its habits. A small stream runs north-west to the Loangwa, along which cattle get good grazing amongst the reeds. Many bird specimens of interest were obtained in the one day's stay here. The hill Pirikwamba was ascended to get rays to Masisi and other hills, Masisi appearing almost due east, while Panda peak could faintly be discerned.

Retracing my steps to Kamboni, the journey was continued on the plateau before referred to. The path led up by a climb of about 800 feet, then winding over an undulating plateau which had recently been burned over. The grass grows strong and long, and the plateau is dotted here and there with small clumps of trees, which, owing to these spots being dry, had not escaped the fire, interesting botanical specimens being consequently unobtainable. A better-watered part was reached after about five hours' march from Kamboni hill, a few villages being then met with, and cattle in good condition observed in considerable numbers. Evidently this place is not molested by wild animals, as cattle are not housed at night, but sleep in the open.

Halting at a village in a slight hollow, we obtained 4887 feet as the elevation, while the previous night at Namwiwi's village it was 4551 feet. A few hours' march took us over this plateau and across the upper waters of the Lufira, swiftly flowing to the north-east through a series of hills, amongst which I camped at noon, using the afternoon in exploring Mount Masisi, an isolated peak of about the same height as the smaller Namitawa. This on its south-east slopes is thickly wooded, all other parts being covered with grass about 2½ feet high and very thick. Rays were taken to Panda peaks, Nacheri, Mpata, and other hills. The haze was too dense for photography. Bushbuck are plentiful on the hills adjacent to Masisi, the larger game frequenting the lower slopes on the North Rukuru. In the better-watered parts of these hills, a number of old *Landolphia* rubber vines were seen, very much cut and barked, but now healed over considerably. The milk which exuded on cutting was of great consistency, and showed scarcely any water, producing a rubber very light in colour and of good quality.

Leaving the neighbourhood of Masisi, we struck towards a range of high mountains a little to the south-east, and after three hours' walking over ridges and down a long slope, the plain was again struck.

A number of villages were passed, and cattle in fair numbers were seen; but none of the villagers would accompany us as guides to the mountains, saying there was no water across the plain, and that there were no villages. The Karonga path was followed for a short distance, but as this appeared to lead too much away from the mountains, we struck across the plain through high grass, eventually following the dry bed of a wet-season torrent, in which there was no water for some miles, and then only in some deep fissures of the rocks was some green fluid found, which was, nevertheless, eagerly drunk by the parched natives. The country here was fairly well wooded, but extremely parched; not a green leaf on the trees, and no bird-life visible. It looked probable that the camp would have to be pitched for the night in a waterless district. Hope was given up, and I almost decided to retrace my steps to the village, then about 6 miles away. Everywhere the trees were burnt up, and no watercourses visible. Natives were sent out in all directions, and after some time the welcome sound "Madzi alipo" (Here is water) was heard away down the slope, and in a short time every one was making quickly for what turned out to be the North Rukuru river. It was low down in the hollow and out of view, hence its green trees could not be seen 200 yards away. The camp was pitched by its side for a rest on the Sunday, as we had been walking continuously the whole of the week.

At the crossing of the Rukuru near Karonga there was very little water, but at this point there was a large flow of water with numerous fish about the size of burn trout. Being in the vicinity of the peaks named Panda, I ascended one on Monday, and, if Masisi is a little higher, it was much easier to climb than Panda. After an ascent of about 1000 feet, a small plateau or crater-shaped basin was met with, its eastern edge being the Panda peaks, while the other edges were hills of lesser proportions. It appeared to be a veritable game preserve, where rhinoceros, buffalo, zebra, and wart-hog had full possession. Smaller antelopes were also plentiful, but rhinoceros appeared to be most numerous from their spoor. Buffalo were in considerable numbers close to the Rukuru. Zebra and roan antelope were seen in pairs or singly, and were met with near the summit of Panda.

The flora of Panda was similar to that of Namitawa and Mlanje at similar elevations; the altitude obtained was 6381 feet. Some beautiful aloes were in flower, also Hypericums and Sedum-like plants, devoid of leaves, but having spikes of beautiful white star-like blossoms. From this peak diagonal rays were obtained to many prominent peaks in the vicinity, some of them being indistinct through the haze, but recognizable. Almost due south there appeared, faintly, the highest point of an important range of mountains. These had been kept in view for some time, and as I could gain no information respecting them, I was the more anxious to learn their true nature. From the high peak I was on, a route which appeared practicable was selected, viz. to follow up the Rukuru some miles, then to round the precipitous face of the range, and follow a long spur which seemed to lead continuously to the summit. The descent from Panda was scarcely less arduous than the ascent.

Leaving the Rukuru camp next morning, the route followed up the stream for some miles over remarkably dry and rough country, crossing one tributary of the Rukuru, which came from the mountains to the east between Panda and the larger range. This had a considerable flow of clear water, indicating drainage of a large extent of land higher up. Travelling was continued—with a halt of an hour only—till 3.30 p.m., when the spur of the mountain to be climbed was reached, and the camp pitched. Traces of recently cultivated gardens were seen at this place, but no people.

Ascending an adjacent small hill, Mount Masisi had a compass bearing of 251°; the boiling-point thermometer gave the height of the camp at a small stream as 4291 feet, and from this position to the summit appeared to be at least another 3000 feet. Next morning the ascent was begun at 5.30 a.m., and the summit reached at 8.30 a.m., the route taken justifying the selection, as no insurmountable obstacles were encountered. As is the case with most mountains, game-tracks lead up the spurs, and by following one of these the ascent was easily made. After a halt of a few minutes at the ridge, progress was made north-east over what appeared to be a large plateau. From the many game-tracks seen in all directions, and occasional glimpses of roan antelopes, game seemed to be plentiful, and at noon a herd of fourteen zebra was seen a short distance off, one or two foals being in the herd.

The camp was pitched by the side of a small stream at 2.30 p.m. The ground traversed was undulating, and rocks were not numerous, but long rolling ridges were the striking features. Most of these had been recently burned over, but where this was not the case, the ground was covered by short grass 6 to 9 inches long, which was a season's growth. As little eminences were crossed, these ridges were seen to extend indefinitely in all directions, constituting one grand plateau at what I judged about 7500 feet above sea-level; nothing but rolling downs as far as the eye could reach, with no apparent depression on any side to indicate the limits of this plateau. Leaving camp at 3 p.m., I proceeded south-west about 2 miles to explore the plateau in that direction. A slight depression was apparent away to the south-west, and as the trend of the numerous streamlets was in that direction, I concluded that the north Rukuru river had its source on this part of the plateau. Between the long sweeping ridges were hollows, often of a very spongy nature, and resembling the black bogs in Scotland, with occasionally the usual little deep pools. From these bogs oozes the water which forms streamlets, and ultimately the larger rivers. At the time of my visit, rain had been generally deficient throughout the Protectorate, but on the Nyika plateau, at places nearly 8500 feet, beautiful clear water could be had in plenty. Where it was sufficient to form streams, these were swift and of a brownish colour, nevertheless the water was of the purest description. Some roan antelopes were seen close to camp, and zebra appeared to be so common that any object seen on the sky-line might safely be assumed to be these animals, standing immovable and on the alert. There was little or no bush, and it was with difficulty that sufficient firewood could be obtained for cooking purposes from old scraggy heaths. Darkness followed sunset rapidly, and the air quickly became very crisp.

At this camp, owing to the cold, the carriers became very discontented, and it was hoped that next day the camp would be at a lower elevation and warmer. The temperature under the outer cover of the tent at 7 p.m. was—dry bulb, 51°; wet bulb, 46°. Boiling-point thermometer gave the height of the camp in the hollow as 7328 feet, and about 600 feet lower than the general level of the ridges. At 6 a.m. on September 18 (dry bulb, 46°; wet, 44°), a start was made to further explore the plateau, and if possible reach Deep bay. Heavy dew had fallen during the night, but at 7 a.m. a very cold biting east wind was blowing. After travelling about two hours along the upper ridges, and avoiding all unnecessary descents, the highest point came into view, and quick walking brought us to its base, near which was a small clump of trees of diminutive growth. The ascent of this eminence was made in one hour, and on this point lay the key of the situation.

A little to the north lay Panda, and north-west, Masisi. North and north-east, separated by a long deep ravine or valley, through which flowed a feeder of the Rukuru—crossed two days previously—extended a series of mountains, rocky and precipitous, and well over 8500 feet, joining on to the eastern ridges of the plateau some 10 miles away; whilst to the south-east a gradual depression was clearly defined, flanked by a prominent peak of Karabwi, estimated at 8000 feet, with a series of high ridges on the horizon. A long continuation of the plateau extended to the south, with no outstanding features. To proceed east meant a two days' journey with dissatisfied carriers who thought themselves lost, hence a better route had to be thought of. The depression to the south-east—lead where it might—at least promised a gradual descent to the lake, and a choice of this route was therefore made. The altitude of Nacheri was found to be 8518 feet. The hazy nature of the atmosphere rendered photography anything but satisfactory.

Proceeding along the course of the stream at a quick pace and descending, the camp was pitched at 4.30 p.m., just before which hour we passed a herd of twenty roan antelope. Klipspringer were plentiful in some of the lower hollows. As the sun declined, the air, which was hot at no time during the days on the plateau, became much colder than on the previous evening. The altitude of the camp was 6161 feet.[1] At 6 p.m. the dry bulb was 48°, wet 44°; and at 8 p.m. the temperature had fallen to 42° dry bulb, and 48°·5 wet; dew falling heavily as the full moon rose over the crest of the mountains. A remarkable feature at the camps at these high elevations was the stillness of the night. Scarcely a sound could be heard, except the peculiar whistling of some night bird which sounded thus, "Tw-we—twir-r," otherwise no sound of insect life such as is common at lower elevations.

The night was very cold, and in the morning I felt certain that there had been frost. In a few minutes a boy brought in a handful of ice that he had found deposited on the boxes outside. At 6 a.m., September 19, the dry bulb stood at 33°, and wet at 32°·5, while all around lay hoar frost on the ground. The cold was felt very severely by the natives, who lost no time in setting about to shift the camp to some lower place. A long walk by the stream eventually brought us to the foot of Karabwi at 1 p.m., and, sending on the carriers to some villages, I ascended the peak. To about 7500 feet it is short grass, after which it is very precipitous rock, and rises to 8046 feet. From its summit the first welcome view of Lake Nyasa was seen, notably the long curve of the sandy beach of what is known as Young's bay. East of Karabwi the country is of a very broken description, cut by deep ravines, well wooded, but impassable without very severe climbing. West of Karabwi lies the valley of the Rumhi, the slopes of the plateau ending in a point to the south-west, well wooded to its crest.

When passing a small hamlet of three huts before reaching Karabwi, the villagers said that it was possible to reach Kondowi Mission station that day. It was, however, invisible from any point on Karabwi, so I did not expect to reach it. From the peak to the camp was about 3½ hours' walking through the dense vegetation to a village on the banks of the Rumhi, and here we were told that Deep bay could be reached next day. Although so rough and broken by deep ravines, a fair sprinkling of villages was seen dotted on the steep hill slopes, where maize and haricot beans were principally cultivated. A swamp crossed during the day's march exhibited much oxide of iron on the surface of its stagnant water. The height of the camp at Chimbuli's village on the Rumhi was 4780 feet.

Heavy rain was falling at 5.30 a.m. next morning, and the start was delayed a little, the rank vegetation on either side of the path being very wet. After about three hours' journey towards Kondowi, over a series of ridges and dales, Kondowi was finally reached. The station is some distance inland, south-west from Deep bay, and near to Mount Waller, a mountain I had been looking for for several days, and which, being only some 4800 feet high, could not be seen from high elevations.

From board ship on Lake Nyasa, Mount Waller appeared to be very high, but from the level of the lake the first ridges are deceptive, and appear higher than they really were. It being then Saturday, a halt of a day or two was made at Kondowi, where the interesting work of this mission was seen in full swing. Even at night the schools were crowded with studious natives, eagerly preparing for their approaching examinations. The wooded slopes of the Nimkowa heights were ascended on Monday, rays being taken to prominent hills south and south-west. Although very hazy, one could trace out the mountains forming the southern limits of the plateau at the base of which lay the great Ahenga valley, through which flows the southern Rukuru river from beyond Mombera's country.

Some interesting specimens were obtained on Nimkowa, which was 6640 feet in altitude. The forest at this elevation is composed of evergreen deciduous trees of great age and much value. That on Nimkowa extends for a considerable distance along the ridges of mountains back to Karabwi and also to the northward. Mr. Adamson of the Livingstonia Mission very kindly showed me through the woods and the sawpit, and also supplied me with specimens of the timber used by him. The principal cut is locally named "m'ndopi," a good class of wood, with fine grain, and often obtained in lengths of from 50 to 60 feet—fairly straight logs with a diameter of 18 to 20 inches, not tapering as much as do coniferæ. "Masuka," "muhihi," "malombe," and "chiere" are names of different woods used, the last mentioned being a particularly light wood showing a remarkable arrangement of cells both in transverse and longitudinal sections. From Nimkowa heights good views are obtained across Lake Nyasa to Amelia bay on the east; to the mountainous country bordering on Nkata bay on the south; along the Ahenga valley to Mount Jakwa and Mombera's country to the south-west; and to the spurs of the Nyika plateau on the west.

Staying over the night at Nimkowa, the temperature was 63° at 8.30 p.m., a good breeze blowing from Lake Nyasa. After packing up cases of botanical and zoological specimens, and sending them to the lake to be picked up by the gunboat, the journey was resumed next day; but, on calling the carriers together, about eighteen had decamped and were said to have gone back to their homes. With compressed and reduced loads, my hospitable friends at the Kondowi Mission were left next day, my object then being to proceed to Mwanemba point, and explore the Nyika plateau further, thence proceeding along the Ahenga valley and on to Nkata bay. I had still plenty of rice for the carriers, in case no food could be bought. The route from Kondowi rapidly descends through a series of ravines, in which flow the big tributaries of the Rumhi, bringing down the drainage of the mountainous country abutting on Nimkowa. It finally passes along another ravine, through which flows the Rumhi itself, this being the river previously mentioned as taking its rise on the slopes of Nacheri. It forms here a river of considerable size, swift flowing, with clear, good water, being about 20 feet wide and 3 feet deep, and must discharge a considerable amount of water into the lake during the wet season.

The vegetation round Nimkowa and Mwanemba indicates a heavy rainfall, and there is much country drained by the Rumhi. On some maps it is shown as flowing into the Rukuru, but of this I am doubtful. I did not, however, especially look into this matter, but from a distance, such as Mwanemba point, the Rumhi appears to take a course to the lake, entering immediately south of Mount Waller, while the Rukuru, it is known, enters the lake between a small ridge of hills and the base of the foothills of Mount Samara.* This small ridge of hills appears to be the termination of the Ahenga valley, and, I have no doubt, forms a very precipitous eastern face similar to Mount Waller, but to the south-west it is only a continuation of the general level of the valley. The Rumhi gathers its waters from the Nyika plateau, east and south of Mwanemba, and flows along the north side of the small ridge of hills mentioned above; while the Rukuru receives no affluents till near Mount Jakwa, where it runs along the base of the foothills of the plateau, thence across the valley, and due north-east between the aforementioned ridge and the mountains to the south, prominent amongst which are Mayui, Mount Choma, and Mount Samara.

Whilst absent collecting next day, the carriers decamped, leaving me at 6000 feet to get my loads down as best I could. I sent boys after them to try and induce them to continue their journey to Nkata, but they could not be found. It is thought that they were afraid of again camping on the plateau at high elevations, and this can have been their only reason for leaving. This desertion was very disappointing, as I intended to further explore the Nyika plateau away to the west from Mwanemba, but all that I could do now was to go as far as I could one day and return to camp. The face of Mwanemba I found to be thickly covered with rank vegetation and valuable virgin forest. Traces of former troublous times were seen by native grain stores being found in the darkest places of the forest. Villages were observed up to nearly 5500 feet, where maize was grown on the steep slopes. The chief's name was Chedewa, and apparently one to be feared in olden days, because of his practice of placing poisoned spears obliquely in the paths. The forests on Mwanemba are similar to those on Nimkowa, composed of evergreen deciduous trees of great age. The only coniferous tree met with was a species of *Podocarpus*, which does not attain to large dimensions, nor has it any distinctive qualities that might recommend it for use. The specimens to be found on Mwanemba are, however, not numerous. Ascending the plateau, I found that its southern highest point was 8553 feet, whilst away south-west there appeared another high ridge about the same elevation. Travelling from 8 a.m. till 1 p.m., its summit was reached, but a gale of wind prevented the boiling-point thermometer being used satisfactorily. Rays were taken to Nimkowa, Panda, Nacheri, and some high hills 12 miles to the west. When crossing a ridge, a herd of six roan antelopes were met with, apparently having their mid-day rest by a streamlet. They did not move far away on our approach, and allowed me to fix up my tripod camera and get two good views of them, at about 150 yards, but unfortunately both of these plates were stained and blotched, and thus useless. The country traversed was of the same description as that at Nacheri, undulating with short grass—an ideal grazing district for cattle or sheep. Many locusts were in evidence at 8550 feet, and I am of opinion that the great stretch of this undulating land with its very loose soil is, and has been, the breeding-place of countless swarms of this pest. The soil is remarkably loose, and is burrowed enormously by moles. Zebra, roan antelope, klipspringer, and partridge are very plentiful on this part of the plateau, but much shooting would soon reduce their numbers, or drive them from this their safe breeding-ground. They do not appear to be molested by wild animals, as there is no cover for these. Were it necessary or desirable that zebra should be caught alive, there would be little difficulty in doing so on the Nyika plateau, as the animals are very tame, and could easily be driven into one of the numerous hollows, at the head of which had been previously placed a stout net or fence. To retain this natural breeding-ground for zebra and roan antelope, it would be advisable to make the Nyika plateau a preserve. For a good sanitorium this plateau offers all that is necessary. The atmosphere is pure and bracing, with, at times—viz. June, July, and August—some frost. The general level is such as to afford abundant exercise, with a minimum amount of fatigue in climbing hills. The water, met with everywhere in plenty, is delightfully cold and good. With a road from Livingstonia across the Rumpi and up the slopes of Mwanemba, the plateau could be reached in one day from Florence bay, the present journey taking about one day and a half.

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* Mr. Henderson, who gave an excellent description of this country in the *Scottish Geographical Magazine* for February, 1900 (p. 88), says that the Rumhi "pours its waters over cataracts, and falls into the lake close to the mouth of the Rukuru."—Ed. *G.J.*

Owing to the carriers leaving me on Mwanemba, my loads had to be reduced, only necessaries being taken, while plants, ferns, etc., had to be left behind. I succeeded in getting one or two people from a village, but not sufficient to fill the places of those who decamped. Each native had now to carry his own food, to last till we should reach Nkata bay, all calico having been divided out and now finished. Marching from Mwanemba, along the Ahenga valley, through several miles of rich ground, covered by masuka trees, and crossing several streams, evidently tributaries of the Rumpi, we reached the southern Rukura river at 4 p.m. It is here a broad stream with a sandy bottom, about 40 feet wide, and a little more than ankle-deep. In the wet season it would appear to be a very large river, flooding a large extent of country along its course. Reedbuck and bushbuck were plentiful, while traces of buffalo were seen. The boiling-point thermometer gave the height of our crossing the Rukuru as 3444 feet.

Continuing the journey up the right bank of the river, Mount Jakwa was reached about noon, the southern Rukuru coming between Jakwa and the Mwanemba range of hills. By following up the dry bed of a tributary of the Rukuru named Linyanga, thickly populated country was entered, and cattle were seen in large numbers. It might be advisable at this point to state, for the benefit of future travellers, that fresh milk may generally be had throughout most of the country which I traversed. There would be no difficulty experienced, by those who might visit the plateau in search of health, in having cattle taken up from the villages below, thus securing a supply of fresh milk and butter.

Mombera's country was entered towards noon on the following day, the neighbourhood of Mount Jakwa having been left at daybreak. The Ekendeni station of the Livingstonia Mission was reached at 1 p.m. This march was particularly fatiguing. The path (well defined) along the Ahenga valley was very hot and trying to the carriers' feet, while shelter from the sun was impossible, no trees or green vegetation being visible for miles over this thickly populated district. Villages were numerous, and consisted of from one to five hundred huts, closely packed together. At this season the male population was almost entirely absent, all able-bodied men and boys being away at Blantyre, Zomba, or elsewhere, at work. From the timberless appearance of the district, it would appear that every year the necessities of cultivation extend outwards from the site of the present villages. Mr. Stewart, who has been for some years resident at Ekendeni, says that it is only within recent years that such a complete clearing of timber off the land has taken place. Rainfall was deficient throughout this part of the Protectorate last year, and has also been scanty this year. The mission station is adjacent to the stream Linyanga, which has generally plenty of water, but it was very low at the time of my visit, and a little lower down was altogether dry. The altitude of Mr. Stewart's house is 4346, being almost 900 feet above the crossing of the Rukuru.

After a halt of one day at Ekendeni, a start was made in a north-easterly direction towards Nkata bay. Leaving the bleak country around Ekendeni, the path led through much low scrub, heaths, etc., similar to those met with south of Namitawa, and through many new gardens, evidently being prepared for the growth of much "mayeri." Many acres of land were now cut over, the timber lying in great masses, 3 feet deep, and acres in extent. Crossing the upper water of the Linyanga, near Kuningini mountain, about 11 a.m., Kuningini slopes were descended by 2 p.m. There is a marked alteration in the landscape at the base of this mountain as compared with Mombera's country further west, the country being heavily timbered and well watered by numerous streamlets. With the exception of one or two months in very dry years, the rainfall of Nkata district is satisfactory, and owing to its position on the lake, and to the numerous well-wooded small hills, the climate of this district is considered to be the most equable in the Protectorate.

Bordering on the Kuningini and Mayumi mountains there is very suitable coffee land, while along the Limpasa valley sugar and tobacco might be successfully grown, and I have no doubt that wheat would succeed equally as well as on the Shire highlands. Angoni or Atongi labour is near at hand and abundant. The woods would also be most suitable and natural for successful rubber cultivation, while the landing at Nkata bay is well known as one of the safest on the lake.

Nkata bay was reached on October 4, after I had been exactly one month on the journey from Fort Hill.

NOTES TO ACCOMPANY MAP OF THE YAVARY.*

By C. SATCHELL.

The Yavary as it is written by the Peruvians and Bolivians, or Javary as it is called by the Brazilians, forms a portion of the frontier between Brazil and Peru, while the Bolivian frontier joins the other two at the source. Above the confluence of the Galvez, the Yavary is known as the Yaquirana (Brazilian, Jaquirana). In the flood season, say from November to May, the Yavary is navigable for steamers drawing 8 feet as far as the Coruça, about 208 geographical miles from its mouth. At all times such steamers get as far as Itecauhy, 33 miles.

In 1901 we travelled in a steamer drawing 7 feet as far as Saudades, 258 miles from the junction of the Yavary and Solimoẽs; thence as far as R. Bathan (708 miles from the Solimoẽs) in a launch drawing 3 feet 3 inches; and from this point to Rumi Yacu (817 miles from the mouth) in canoes. The total length of the Yavary from its source to its mouth (or confluence with the Solimoẽs) is about 825 geographical miles. The source is about 1250 feet above sea-level; it is a small spring oozing from the ground on a steep slope. The river, throughout its course, runs through a forest, unbroken except by the small clearings made by the rubber-gatherers around their huts. These clearings rarely exceed an acre in extent. Rubber-gathering is practically the sole industry, and is decaying.

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* Map. p. 484.

There may be 3000 people inhabiting the banks of the Yavary, not including "savage" Indians. We never saw one of these savages, but on our downward journey we stopped at a place where, a few days before, the whole of the inhabitants, seventeen in number, had been murdered by Indians of the tribe known as Mayus. This occurred in lat. 6° 35′. No trustworthy reports as to the numbers of the "savages" can be obtained, but it appears that those on the right, or Brazilian, bank are known as Rhemus, while those on the left, or Peruvian, side are Mayus and Capanaguas. These Indians have been driven away from the banks of the river by the Peruvians and Brazilians who have gone there in search of rubber.

The survey was made by means of a traverse, the bearings being taken by a 12-inch compass and the distances estimated, the whole being checked by observations for latitude and longitude. For these observations, the instruments used were a 6-inch transit theodolite, six chronometers, and a 3½-inch telescope for occultations.

In August, 1901, at the source, the variation of the compass was 7° 10′ easterly. The average temperature of the water was 76° at the mouth, and 71° 10 miles from the source.

We were on the Yavary from April till October, 1901.

TERRESTRIAL MAGNETISM IN ITS RELATION TO GEOGRAPHY.*

By Captain ETTRICK W. CREAK, C.B., R.N., F.R.S.

Of the six distinguished naval officers who have previously presided over this Section, four were Arctic explorers; and therefore, possessing personal experience in Arctic regions, they naturally gave prominence to the deeply interesting subject of the past and future of Arctic discovery in their addresses, whilst not forgetting other matters relating to the geography of the sea. The remaining officers, from their immediate connection with all that relates to the physical condition of the ocean, in its widest sense, coupled with the great importance of giving the fruits of their knowledge to the world, took that subject as their principal theme.

Valuable as are contributions to our knowledge of the physics of the ocean to the world in general, and especially to the mariner and water-borne landsman, I propose to take a different course, and bring to your notice the subject of Terrestrial Magnetism in its relation to Geography. In doing so, I shall endeavour to show that much may be done by the traveller on land and the seaman at sea in helping to fathom the mysteries connected with the behaviour of the freely suspended magnetic needle, as it is carried about over that great magnet, the Earth, by observations in different regions, and even in limited areas.

I would, however, pause a moment to call attention to the presence of several distinguished meteorologists at this meeting, who will surely attract many to the consideration of matters connected with the important science of meteorology, which already occupies considerable attention from travellers. I feel sure, therefore, that geographers will be glad to accord a hearty welcome to the members of the International Meteorological Congress now assembled in this town, and especially to the foreign visitors who honour us by their presence.

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* Presidential Address to the Geographical Section of the British Association, Southport, 1903. Maps, p. 484.

Some one may ask, What has Terrestrial Magnetism to do with Geography? I reply, excellent lectures on that subject of growing importance have been given under the direct auspices of the Royal Geographical Society; one in 1878 by the late Captain Sir Frederick Evans, and another in 1897 by Sir Arthur Rücker. And I would here quote the opinion of Dr. Mill when defining geography, in my support: "Geography is the science which deals with the forms of the Earth's crust, and with the influence which these forms exercise on the distribution of other phenomena."

We know now that the normal distribution of the Earth's magnetism for any epoch is in many localities seriously affected accordingly as the nature of the country surveyed be mountainous, or generally a plain, in the form of islands (or mountains standing out of the sea), and from land under the sea. There is also reason to suspect that the magnetism of that portion of the Earth covered by the oceans differs in intensity from that of the dry land we inhabit. A connection between the disturbances of the Earth's crust in earthquakes and disturbances of the magnetic needle also seems to exist, although the evidence on this point is not conclusive.

Magnetic Surveys.

Previously to the year 1880 there were two periods of exceptional activity on the part of contributors to our knowledge of the Earth's magnetism, during which the scientific sailor in his ship on the trackless ocean combined with his brethren on land in making a magnetic survey of the globe.

The first period was that of 1843–49, during which not only were fixed observatories established at Toronto, St. Helena, Capetown, and Hobart for hourly observations of the movements of the magnetic needle, but, to use Sabine's words, 'that great national undertaking, the Magnetic Survey of the South Polar Regions of the Globe,' the forerunner of our present Antarctic Expedition, was accomplished by Ross and his companions almost entirely at sea.

This Antarctic survey was carried out during the years 1840–45, and the results given to the world as soon as possible by Sabine. The results afterwards formed a valuable contribution when constructing his maps of equal lines of Magnetic Declination, Inclination, and Intensity for the whole world, a great work for the completion of which Sabine employed every available observation made up to the year 1870, whether on land or at sea.

Readers of these contributions cannot fail to be struck with the great number of observations made by such travellers as Hansteen and Due, Erman and Wrangel, extending from Western Europe to far into Siberia.

The second period was that of 1870–80, during which not only was there much activity amongst observers on land, but that expedition so fruitful to science, the voyage of H.M.S. *Challenger*, took place. During the years 1872–76 we find the sailor in the *Challenger* doing most valuable work in carrying out a magnetic survey of certain portions of the great oceans, valuable not only for needful uses in making charts for the seaman, but also as a contribution to magnetic science.

Prior to this expedition very little was known from observation of the distribution of Terrestrial Magnetism in the central regions of the North and South Pacific oceans, and Sabine's charts are consequently defective there.

Combining the *Challenger* magnetical results with those of all available observations made by others of H.M. ships, and by colonial and foreign governments, I was enabled to compile the charts of the magnetic elements for the epoch 1880, which were published in the report of the scientific results of H.M.S. *Challenger*. I will venture to say that these charts give a fairly accurate representation of the normal distribution of the Earth's magnetism between parallels of 70° N. and 40° S. Beyond these limits, either northward or southward, there is a degree of uncertainty about the value of the lines of equal value, especially in the Southern regions, an uncertainty which we have reason to hope will be dissipated when we know the full results obtained by Captain Scott and the gallant band he commands, for as yet we have to be content with some eddies of the full tide of his success.

Until the *Discovery* was built, the *Challenger* was the last vessel specially selected with a view to obtaining magnetic observations at sea, so that for several years past results obtained on land have been our mainstay. Thus, elaborate magnetic surveys with fruitful results have been carried out in recent years in the British Isles by Rücker and Thorpe. France, Germany, Holland, and some smaller districts in Europe have also been carefully surveyed, and British India partially so, by Messrs. Schlagintweit in 1857–58. The latter country is being again magnetically surveyed under the auspices of the Indian Government.

On the American continent the Coast and Geodetic Survey of the vast territories comprised in the United States, which has been so many years in progress, has been accompanied by an extended magnetic survey during the last fifty-two years, which is now under the able direction of Dr. L. A. Bauer. Resulting from this, some excellent charts of the magnetic declination in the United States have been published from time to time; and the last, for the epoch 1902, is based upon 8000 observations.

There are other contributions to terrestrial magnetism for positions on various coasts from the surveying service of the Royal Navy, and our ships of war are constantly assisting with their quota to the magnetic declination, or variation, as sailors prefer to call it; and wisely so, I trow, for have they not the declination of the sun and other heavenly bodies constantly in use in the computation of their ship's position?

This work of the Royal Navy and the Indian Marine is one of great importance, both in the interests of practical navigation and of science; for besides the equipment of instruments for absolute determinations of the declination, dip, and horizontal force supplied to certain of our surveying-ships, every seagoing vessel in the service carries a landing compass, specially tested, by means of which the declination can be observed with considerable accuracy on land.

Although observers of many other objects may still speak of their "heritage the sea" as a mine of wealth waiting for them to explore, unfortunately for magnetic observations, we can no longer say "the hollow oak our palace is," for wood has been everywhere replaced by iron or steel in our ships, to the destruction of accurate observations of dip and force on board of them. Experience, however, has shown that very useful results, as regards the declination, can be obtained every time a ship is "swung," either for that purpose alone, or in the ordinary course of ascertaining the errors of the compass due to the iron or steel of the ship.

As an example of this method, the cruise of the training squadron to Spitsbergen and Norway in 1895 may be cited, when several most useful observations were made at sea in regions but seldom visited. Again, only this year a squadron of our ships, cruising together near Madagascar, separated to a distance of a mile apart and "swung" to ascertain the declination.

I would here note that all the magnetic observations made by the officers of

H.M. ships during the years 1890–1900 have been published in a convenient form by the Hydrographic Department of the Admiralty.

The fact remains, however, that a great portion of the world, other than the coasts, continues unknown to the searching action of the magnetic needle, whilst the two-thirds of the globe covered by water is still worse off. Amongst other regions I would specify Africa, which, apart from the coasts, Cape Colony, and the Nile valley to lat. 5½ N., is absolutely a new field for the observer.

Moreover, the elaborate surveys I have mentioned show how much the results depend upon the nature of the locality. I am therefore convinced that travellers on land, provided with a proper equipment of instruments for conducting a land survey of the strange countries which they may visit, and mapping the same correctly, can, with a small addition to the weight they have to carry, make a valuable contribution to our knowledge of terrestrial magnetism, commencing with observations at their principal stations, and filling in the intermediate space with as many others as circumstances will permit.

The Antarctic Expedition.

Of the magnetic work of our Antarctic Expedition we know that since the *Discovery* entered the pack—and, as far as terrestrial magnetism is concerned, upon the most important part of that work—every opportunity has been seized for making observations.

Lyttelton, New Zealand (near which there is now a regular fixed magnetic observatory), was made the primary southern base-station of the expedition; the winter quarters of the *Discovery*, the secondary southern base-station. Before settling down in winter quarters, magnetic observations were made on board the ship during the cruise to and from the most easterly position attained off King Edward VII. Land in lat. 76° S., long. 152½° W., and she was successfully swung off Cape Crozier to ascertain the disturbing effects of the iron upon the compasses and dip and force instruments mounted in the ship's observatory.

As a ship fitted to meet the most stormy seas and to buffet with the ice, the *Discovery* has been a great success. Let me add another tribute to her value. From Spithead until she reached New Zealand, but small corrections were required for reducing the observations made on board. The experience of Ross's Antarctic expedition had, however, taught the lesson that two wood-built ships, the *Erebus* and *Terror*, with but some 3° to 4° of deviation of the compass at Simon's bay, South Africa, found as much as 56° of deviation at their position farthest south, an amount almost prohibitory of good results being obtained on board.

How fared the *Discovery?* I have been told by Lieut. Shackleton—for the cause of whose return to England we must all feel great sympathy—that a maximum of only 11° of deviation was observed at her most southerly position. From this we may look forward hopefully to magnetic results of a value hitherto unattained in those regions.

At winter quarters, besides the monthly absolute observations of the magnetic elements, the Eschenhagen variometers or self-registering instruments for continuously recording the changes in the declination, horizonal force, and vertical force were established, and in good working order at the time appointed for commencing the year's observations.

I may here remind you that some time previously to the departure of the British and German Antarctic expeditions, a scheme of co-operation had been established between them, according to which observations of exactly the same nature, with the same form of variometers, were to be carried out at their respective winter quarters during a whole year, commencing March 1, 1902. Besides the continuous observations with the variometers, regular term-days and term-hours were agreed upon for obtaining special observations with them at the same moment of Greenwich mean time. Both expeditions have successfully completed this part of their intended work.

To co-operate in like manner with these far southern stations, the Argentine Government sent a special party of observers to Staten island, near Cape Horn, and the Germans another to Kerguelen Land, whilst New Zealand entered heartily into the work. In addition, similar observations were arranged to be made in certain British and colonial observatories, which include Kew, Falmouth, Bombay, Mauritius, and Melbourne; also in German and other foreign observatories.

We have all read thrilling accounts of the journeys of the several travelling parties which set out from the *Discovery*, and of the imminent dangers to life they encountered, and how they happily escaped them except one brave fellow named Vince, who disappeared over one of those mighty ice-cliffs, upon which all Antarctic voyagers descant, into the sea. In spite of all this, there is a record of magnetic observations taken on these journeys of which only an outline has yet been given. Anticipations of the value of these observations are somewhat clouded when we read in one report that hills "more inland were composed of granite rock, split and broken, as well as weatherworn, into extraordinary shapes. The lower or more outer hills consisted of quartz, etc., with basaltic dykes cutting through them." Consequently, we have to fear the effects of local magnetic disturbances of the needle in the land observations, whilst buoyed up with the hope of obtaining normal results on board the ship.

Judging from some land observations which have been received, it appears that considerable changes have taken place in the values of the magnetic elements in the regions we are considering, but when making comparisons we have to remember the sixty years which have elapsed since Ross's time, and that he had nothing like the advantage of steam for his ships, or of instruments of precision like our present ship *Discovery*. His ships also were, as we have already remarked, much worse magnetically, causing far more serious disturbance of the instruments. Hence the changes we note may not be entirely due to changes in the Earth's magnetism.

The observations made by the officers of the *Southern Cross* at Cape Adare in 1899–1900 also contribute to this question of magnetic change.

The Magnetic Poles of the Earth.

I will now refer to those two areas on the globe where the dipping needle stands vertically, known as the magnetic poles. The determination of the exact position of these areas is of great importance to magnetic science, and I will just glance at what is being done to solve the problem.

Let us consider the north pole first, the approximate position of which we know best from observation. If one were asked to say *exactly* where that pole has been in observation times, whether it has moved, or where it now is, the answer must be, "I do not know." It is true that Ross in 1831, by a single observation, considered he had fixed its position, and, I believe, hoisted the British flag over the spot, taking possession thereof; but he may or may not have set up his dip circle over a position affected by serious magnetic disturbance, and therefore we must still be doubtful of his complete success from a magnetic point of view. Although eminent mathematicians have calculated its position, and Neumayer, in 1885, gave a place to it on his charts of that year, we have still to wait for observation to settle the question, for one epoch at least.

Happily, I am able to repeat the good news that the Norwegian, Captain Roald

Amundsen, sailed in June last with the express object of making a magnetic survey of Ross's position and of the surrounding regions, in order to fix the position of the north magnetic pole. Furnished with suitable instruments of the latest pattern, he proposes to continue his investigations until 1905, when we may look for his return and the fulfilment of our hopes.

As far as we can now see, the south magnetic pole cannot be approached very nearly by the traveller, and we can only lay siege to it by observing at stations some distance off, but encircling it. We have our own expedition on one side of it, and now with the return of the *Gauss* to South Africa in June last, we have learnt that that vessel wintered in lat. 66° 2′ S., long. 89° 48′ E., a position on the opposite side of the supposed site of the magnetic pole to that of the *Discovery*. We may now pause to record our warm congratulations to Dr. von Drygalski and his companions on their safe return, accompanied by the welcome report that their expedition has proved successful.

In addition to the British and German expeditions, there are the Swedish expedition and the Scottish expedition. Therefore, with so many nationalities working in widely different localities surrounding it, we have every reason to expect that the position of the south magnetic pole will be determined.

The Secular Change.

When, in the year 1600, Gilbert announced to the world that the Earth is a great magnet, he believed it to be a stable magnet; and it was left to Gellibrand, some thirty-four years later, by his discovery of the annual change of the magnetic declination near London, to show that this could hardly be the case. Ever since then the remarkable and unceasing changes in the magnetism of the Earth have been the subject of constant observation by magneticians, and of investigation by some of the ablest philosophers in Europe and America. Year after year new data are amassed as to the changes going on in the distribution of the magnetism of the Earth, but as yet we have been favoured by hypotheses only as to the causes of the wondrous changes which the magnetic needle records.

These hypotheses were at one time chiefly based upon a consideration of the secular change in the declination, but it is now certain that we must take into account the whole of the phenomena connected with the movements of the needle, if we are to arrive at any satisfactory result. Besides, it will not suffice to take our data solely from existing fixed observatories, however relatively well placed and equipped, and valuable as they certainly are, for it now appears that the secular change is partly dependent upon locality, and that even at places not many miles apart differences in results unaccounted for by distance have been obtained.

The tendency of observation is increasingly to show that the secular change of the magnetic elements is not a world-wide progress of the magnetic needle moving regularly in certain directions, as if solely caused by the regular rotation during a long series of years of the magnetic poles round the geographical poles, for if you examine Map No. 1,* showing the results of observations during the years 1840–80 as regards secular change, you will observe that there are local causes at work in certain regions, whilst in others there is rest, which must largely modify the effect of any polar rotation.

Allow me to explain further. The plain lines on Map No. 1 indicate approximate regions of no secular change in the declination, and the small arrows the general direction (not the amount) in which the north-seeking end of the horizontal needle was moving during those forty years. The foci of greatest change in the declination, with the approximate amount of annual change in the northern hemisphere, are shown in the German Ocean and N.W. Alaska, in the southern hemisphere off the coast of Brazil, and in the South Pacific between New Zealand and Cape Horn. The two foci of greatest annual change in the dip are shown, one in the Gulf of Guinea, where the north-seeking end of the needle was being repelled strongly upwards, the other on the west side of Tierra del Fuego, where the north-seeking end of the needle was being attracted strongly downwards.

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* Originally prepared by the author for the "Magnetical results," H.M.S. *Challenger*, part vi. vol. ii.

It is remarkable that the lines of no change in the declination pass through the foci of greatest change in the dip. If the needle be repelled upwards, as at the Gulf of Guinea focus, it will be found to be moving to the eastward on the east side of the whole line of no change in the declination from the Cape of Good Hope to Labrador; to the westward on the west side. If the needle be attracted downwards, as at the Tierra del Fuego focus, it will be found moving to the westward on the east side of the whole line of no declination from that focus to near Vancouver Island; to the eastward on the west side.

A similar result may be seen in the line passing through a minor focus of the dip near Hong Kong.

Judging from analogy, there should be another focus of change in the dip in lat. 70° N., long. 115° E., or about the position assigned to the Siberian focus of greatest force.

On Map No. 2 are shown lines of equal value of the declination—the red lines for the year 1880, the black lines for the year 1895. From these, when shown on a large scale, we may deduce the mean annual change which has taken place in the declination during the fifteen years elapsed.

In this map we are reminded of the different results we obtain in different localities, for if a line be drawn from Wellington in New Zealand past Cape York in Australia to Hong Kong, little or no change will be found in the neighbouring region since 1840. Again, the line of no change in the declination shown on Map No. 1 to be following much the same direction as the great mountain ranges on the west side of the American continent, has hardly moved for many years according to the observations available.

On the other hand, let us now turn to an example of the remarkable changes which may take place in the declination unexpectedly and locally. The island of Zanzibar and the east coast of Africa were constantly being visited by our surveying-ships and ships of war up to the year 1880, observations of the declination being made every year at Zanzibar during the epoch 1870–80. The results showed that from Cape Town nearly to Cape Guardafui the annual change of that element hardly exceeded 1′.

During the succeeding years of 1890–91 observations were made by the Germans at Dar-es-Salaam and some other places on the neighbouring coasts, with the result that the declination was found to be changing at first 3′ annually, and since that period it had reached 10′ to 12′ at Dar-es-Salaam. Subsequent observations at the latter place in 1896–98 confirmed the fact of the great change, and, in addition, our surveying-ship on the station, especially ordered to "swing" at different places in deep water off the coast, generally confirmed the results. It is remarkable that whilst such great changes should have taken place between Capetown and Cape Guardafui, Aden and the region about the straits of Bab-el-Mandeb seem to be comparatively unaffected.

Local Magnetic Disturbance.

In Map No. 2 normal lines of equal value of the declination are recorded, and as far as the greater part of the globe covered by water is concerned, we may accept them as undisturbed values, for we have yet to learn that there are any local magnetic disturbances of the needle in depths beyond 100 fathoms.

When, however, we come to the land, there is an increasing difficulty in finding districts of only a few miles in extent where the observed values of the magnetic elements at different stations therein do not differ more widely than they should if we considered only their relative position on the Earth as a magnet. Take Rücker and Thorpe's maps of the British Isles and those of the United States, for example, where the lines of equal value are drawn in accordance with the observations, with the result that they form extraordinary loops and curves differing largely from the normal curves of calculation.

From among numerous examples of disturbance of the declination on land, two may be quoted. In the Rapakivi district, near Wiborg, a Russian surveying officer in the year 1890 observed a disturbance of 180°, or, in other words, the north point of his compass pointed due south. At Invercargill, in New Zealand, within a circle of 30 feet radius, a difference of 56° was found. Even on board ships in the same harbour different results are sometimes observed, as our training squadron found at Reikiavik, in Iceland, and notably in our ships at Bermuda.

It is hardly necessary to add that the dip and force are often largely subject to like disturbance, but I do so in order to warn travellers and surveyors that observations in one position often convey but a partial truth; they should be supplemented by as many more as possible in the neighbourhood or district. Erroneous values of the secular change have also been published from the various observers not having occupied exactly the same spot, and even varied heights of the instrument from the ground may make a serious difference, as at Rapakivi before mentioned, and at Madeira, where the officers of the *Challenger* expedition found the dip at a foot above the ground to be 48° 46′ N.; at 3¼ feet above the ground 56° 18′ N. at the same spot.

All mountainous districts are specially open to suspicion of magnetic disturbance, and we know from comparison with normal observations at sea that those mountains standing out of the deep sea, which we call islands, are considerably so affected.

Magnetic Shoals.

The idea that the compasses of ships could be affected by the attraction of the neighbouring dry land, causing those ships to be unsuspectingly diverted from their correct course, was long a favourite theory of those who discussed the causes of shipwreck, but it was "a fond thing vainly invented." I can hardly say this idea is yet exploded, but from what has already been said about local magnetic disturbance on land, it is not a matter of surprise that similar sources of disturbance should exist in the land *under* the sea, for it has been found that in certain localities, in depths of water sufficient to float the largest ironclad, considerable disturbances are caused in the compasses of ships.

An area of remarkable disturbance having been reported as existing off Cossack, North-West Australia, H.M.S. *Penguin*, a surveying-ship provided with the necessary magnetic instruments, was sent by the Admiralty in 1891 to make a complete magnetic survey of the locality, with a view to ascertaining the facts and placing them on a scientific basis. An area of disturbance, 3·5 miles long by 2 miles broad, with not less than 8 fathoms of water over it, was found lying in a north-east by east and south-west by west direction. At one position the disturbing force was sufficient to deflect the *Penguin's* compass 56°; in another—the focus of principal disturbance—the dip on board was increased by 29°, and this at a distance of over 2 miles from the nearest visible land, upon which only a small disturbance of the dip was found.

This remarkable area of disturbance was then called a "magnetic shoal," a term which at first sight hardly appears to be applicable. We have, however, become familiar with the terms "ridge-line, valley-line, peak, and col," as applied to areas of magnetic disturbance on land; therefore I think we may conveniently designate areas of magnetic disturbance in land under the sea "magnetic shoals."

This year H.M. surveying-ship *Research* has examined and placed a magnetic shoal in East Loch Roag (Island of Lewis), but as all our surveying-ships are practically iron ships, it was impossible, from observations on board, to obtain the exact values of the disturbing forces prevailing in this shoal. The reason for this is that, although we may accurately measure the disturbing forces of the iron of the ship in deep water, directly she is placed over the shoal induction takes place, and we can no longer determine to what extent the observed disturbances are due to the ship's newly developed magnetism, or to what extent the shoal alone produces them.

We can, nevertheless, even in an iron ship, accurately *place* and show the dimensions of a magnetic shoal and the *direction* in which a ship's compass will be deflected in any part of it by compass observations only. Is it not, therefore, the duty of any ship meeting with such shoals to stop and fix their position?

The general law governing the distribution of magnetism on these magnetic shoals is that in the northern hemisphere the north point of the compass is drawn *towards* the focus of greatest dip; in the southern hemisphere it is *repelled*. The results at East Loch Roag proved an exception, the north point of the compass being *repelled*.

Terrestrial Magnetism and Geology.

I have already referred to the question of local magnetic disturbance as one of great importance in magnetic surveys. The causes of these disturbances were at one time a matter of opinion, but the evidence of the elaborate magnetic surveys I have alluded to, when compared with the geological maps of the same countries, points clearly to magnetic rocks as their chief origin.

Magnetic rocks may be present, but from their peculiar position fail to disturb the needle; but, on the other hand, as Rücker writes in his summary of the results of the great magnetic survey of the British Isles conducted by Thorpe and himself, "the magnet would be capable of detecting large masses of magnetic rock at a depth of several miles," a distance not yet attained by the science of the geologist.

Again, Dr. Rijckevorsel, in his survey of Holland for the epoch 1891, was convinced that "in some cases, in many perhaps, there must be a direct relation between geology and terrestrial magnetism, and that many of the magnetic features must be in some way determined by the geological structure of the underground."

During the years 1897–99 a magnetic survey was made of the Kaiser-stuhl, a mountainous district in the neighbourhood of Freiburg, in Baden, by Dr. G. Meyer. Exact topographical and geological surveys had been previously made, and the object of the magnetic survey was to show how far the magnetic disturbances of the needle were connected with geological conformations. Here, again, it was found that the magnetic and geological features of the district showed considerable agreement, basaltic rocks being the origin of the disturbance. This was not all, for in the level country adjacent to the Rhine and near Breisach unsuspected masses of basalt were found by the agency of the magnetic needle.

More recently we find our naval officers in H.M.S. *Penguin*, with a complete outfit of magnetic instruments, making a magnetic survey of Funafuti atoll, and assisting the geologist by pointing out, by means of the observed disturbance of the needle, the probable positions in the lagoon in which rock would be most accessible to their boring apparatus.

Leaving the geologist and the magnetician to work in harmony for their common weal, let us turn to some other aspects of the good work already accomplished and to be accomplished by magnetic observers.

Magnetic Charts.

Of the valuable work of the several fixed magnetic observatories of the world, I may remark that they are constantly recording the never-ceasing movements of the needle, the key to many mysteries to science existing in the world and external to it, but of which we have not yet learnt the use. Unfortunately, many of these once fixed observatories have become travellers to positions where the Earth can carry on its work on the needle undisturbed by electric trams and railways which have sprung up near them, and it is to be hoped they will find rest there for many years to come.

Of the forty-two observatories which publish the values of the magnetic elements obtained there, thirty-two are situated northward of the parallel of 30° N., and only four in south latitude; and it is a grief to magneticians that so important a position as Capetown or its neighbourhood does not make an additional fixed magnetic observatory of the first order.

Thus, as far as our present question of magnetic charts and their compilation is concerned, the observatories do not contribute largely, but we should be very grateful to them for the accurate observations of the secular change they provide which are so difficult to obtain elsewhere.

Of the value of magnetic charts for different epochs I have much to say, as they are required for purely scientific inquiry as well as for practical uses. It is only by their means that we can really compare the enormous changes which take place in the magnetism of the globe as a whole; they are useful to the miner, but considerably more so to the seaman. Had it not been for the charts compiled from the results of the untiring labours of travellers by land and observers at sea in the field of terrestrial magnetism during the last century, not only would science have been miserably poorer, but it is not too much to say that the modern iron or steel steamship traversing the ocean on the darkest night at great speed would have been almost an impossibility, whereas with their aid the modern navigators can drive their ships at a speed of 26·5 statute miles an hour with comparative confidence, even when neither sun, moon, nor stars are appearing.

Of the large number of travellers by sea, including those who embark with the purpose of increasing our geographical knowledge of distant lands and busying themselves with most useful inquiries into the geology, botany, zoology, and meteorology of the regions they visit, few realize that when they set foot on board ship (for all ships are now constructed of iron or steel) they are living inside a magnet. Truly a magnet, having become one by the inductive action of that great parent magnet—the Earth.

How fares the compass on board those magnets, the ships, that instrument so indispensable to navigation, which Victor Hugo has forcibly called "the soul of the ship," and of which it has been written—

> "A rusted nail, placed near the faithful compass,
> Will sway it from the truth, and wreck an argosy"?

And if so small a thing as an iron nail be a danger, what are we to say to the iron ship? Let us for a moment consider this important matter.

If the nature of the whole of the iron or steel used in construction of ships were such as to become permanently magnetic, their navigation would be much simplified, as our knowledge of terrestrial magnetism would enable us to provide correctors for any disturbing effects of such iron on the compass, which would then point correctly. But ships, taken as a whole, are generally more or less unstable magnets, and constantly subject to change, not only on change of geographical position, but also of direction of the ship's head with regard to the magnetic meridian. Thus, a ship steering on an easterly course may be temporarily magnetized to a certain extent, but on reversing the ship's course to west she would after a time become temporarily magnetized to the same amount, but in the opposite direction, the north point of the compass being attracted in each case to that side of the ship which is southernmost.

Shortly, we may define the action of the Earth's magnetism on the iron of a ship as follows: The Earth being surrounded by a magnetic field of force differing greatly in intensity and direction in the regions from the north pole to the equator and the equator to the south pole, the ship's magnetic condition is largely dependent upon the direction of her head whilst building and the part of that field she occupied at the time; partly upon her position in the magnetic field she traverses at any given time during a voyage.

For the reasons I have given, magnetic charts are a necessity for practical purposes and in the following order of value. That of the magnetic declination or variation which is constantly in use, especially in such parts of the world as the St. Lawrence and the approaches to the English channel, where the declination changes very rapidly as the ship proceeds on her course. Next, that of the dip and force, which are not only immediately useful when correcting the ship's compass, but are required in the analysis of a ship's magnetism both as regards present knowledge and future improvements in placing compasses on board.

If astronomers have for a very long time been able to publish for several years in advance exact data concerning the heavenly bodies, is it too much to hope that magneticians will before long also be able to publish correct magnetic charts to cover several years in advance of any present epoch? If this is to be done within reasonable time, there must be a long pull, a strong pull, and a pull all together of magnetic observers in all lands, and accumulated data must also be discussed.

On Magnetic Instruments for Travellers.

Travellers in unsurveyed countries, if properly instructed and equipped, can do good service to science by observing the three magnetic elements of declination, inclination or dip, and force at as many stations as circumstances will permit; hence the following remarks.

For the purpose of making the most exact magnetic survey, the best equipment of instruments consists of the well-known unifilar magnetometer, with fittings for observing the declination, and a Barrow's dip circle. To some travellers these instruments might be found too bulky, and in some regions too delicate as well as heavy to carry.

Of suitable instruments made abroad, those used by M. Moureaux in his survey of France may be mentioned, as they are of similar type, but much smaller and lighter than the instruments above mentioned.

Another form of instrument, called an L.C. instrument, for observing both the inclination and total force, is shown in the instrument before you. Originally designed for observations on board ships at sea where the ordinary magnetic instruments are unmanageable, it has also been found to give satisfactory results in a land survey, where greater accuracy is expected than at sea. Thus, during a series of observations extending from the north side of Lake Superior to the southern part of Texas last year, comparisons were made between the results obtained with an L.C. instrument and those of the regular unifilar magnetometer and dip circle, when the agreement was found satisfactory.

I am therefore of the opinion that a traveller, furnished with a theodolite for land-surveying purposes, but fitted with a reversible magnetic needle, can, at any time he observes a true bearing, obtain a trustworthy value of the declination. Dismounting the theodolite from his tripod, the latter will serve for mounting an L.C. instrument with which to observe the inclination and force. Thus, by adding to his ordinary equipment an instrument weighing in its box about 21 lbs., he can obtain valuable contributions to terrestrial magnetism, and at the same time give useful assistance to geological investigations.

Concluding Remarks.

Although a great subject like terrestrial magnetism, even to exhibit our present knowledge of the science, cannot be brought within the compass of an address—for it requires a treatise of many pages—I have brought some of the broad features of it before the section in order to show its connection with geography.

I also entertain the hope that geographers will become more interested in a subject so important to pure science and in its practical applications, and that it will become an additional subject to the instruction which travellers can now obtain under the auspices of the Royal Geographical Society in surveying, geology, botany, zoology, and meteorology.

There is a wide field open to observers, and where results often depend so much upon locality, we require to explore more and more with the magnetic needle. To look over the great oceans and think how little is being done for terrestrial magnetism is a great matter for regret. Yet even there we may begin to be hopeful, for the United States Coast and Geodetic Survey authorities are making arrangements to fit out its vessels with the necessary instruments for determining the magnetic elements at sea.

We wish them all success; but I must again remind you that, although we cannot compel observers to start, there is room for them and to spare.

I would fain make some remarks on the prevailing ignorance of sound geography in many quarters, and on the defective methods of teaching the science; but I feel that the subject is placed in very able hands, and will be fully discussed elsewhere during the present meeting.

REVIEWS.

ASIA.

Khotan.

'Sand-buried Ruins of Khotan.' By M. A. Stein. London: Fisher Unwin. 1903.

A most fascinating book has been written by Dr. Stein on his "finds" in the newly developed field of research in the Takla Makan desert of Chinese Turkestan—a book which will receive more than passing notice from orientalists all the world over. Only two explorers have been personally occupied in these investigations, the eminent traveller Dr. Sven Hedin and Dr. Stein, and their joint discoveries reveal to us a new phase of early mediæval Asiatic history.

A good deal of the book under review is devoted to a narrative of Dr. Stein's journey northward through Gilgit and Kashgar, which, although it is a well-told tale, adds little to our geographical or archæological knowledge. Incidentally he records his faith in the view taken by Lord Curzon of the Oxus source before the Pamirs were surveyed; but he is evidently unaware of the results of those surveys, which prove conclusively that one must look to the Nicolas range, rather than to the mountains at the head of the Ab-i-Panja, for the chief glacial sources of the great river. As a geographer, however, Dr. Stein has done much more than confirm previous records. He has added a great deal of excellent mapping to Asiatic topography about Khotan, sparing no trouble in his afforts to reach untrodden districts, and arming himself beforehand with all available data on which to base his own triangulation. He has thus succeeded in giving to every locality mentioned in his book an exact value in geographical position such as many of them never possessed before. He was much assisted by the pre-existence of Captain Deasy's work, based on the Pamir surveys, and he wisely secured the services of a professional native topographer from the Survey of India.

From the geographical point of view Dr. Stein's work is most valuable; but, of course, the chief interest of his book lies in his archæological discoveries.

Following the indications left in the records of Chinese pilgrims in early times, and greatly helped by the courteous and kindly sympathy of Chinese officials in Kashgar and Khotan, he has been enabled to lay before the world something of a consecutive story of the social and commercial conditions of a great part of the world's highway between East and West as it existed in the days when Buddhism prevailed throughout these regions, ere the tide of Islam had swept through High Asia. Whilst generally confirming the observations of Sven Hedin, he has added immensely to their value by the completeness of his examinations of Buddhist sites, and the discovery of a most extraordinary wealth of early literature. Chiefly in the form of inscribed wooden tablets (but partly on leather) there are records referring to passing local subjects of interest written in several languages. Of these Karosthi is the principal (an early Indian Prakrit, containing Sanscrit terms), but there are also writings in an archaic form of Tibetan, in Chinese, and in Brahmi, dating from the Indo-Scythic period of the early centuries of our era; and (so far as they have been translated) they certify to the existence of well-ordered and flourishing communities in this desert, the incidents of whose daily life routine was not so very different from those which we may observe in the same regions now. Greek influence, as exhibited in seal-cuttings and sculptures, is just as evident there as in Northern India; nor is this surprising, seeing that Khotan was conquered by Indians from Taxila about a century later than the conquest of Taxila by Alexander. Karosthi was the language of Taxila, and Kushana kings ruled the north-west of India for the first two centuries A.D.

Not the least valuable of Dr. Stein's investigations was connected with the exposure of a most comprehensive system of forgeries, which has supplied the archives of certain European museums with specimen writings in "unknown" characters. These forgeries were perpetrated by a clever native at Khotan, which place appears recently to have rivalled Rawal Pindi as the seat of ingenious inventions in this particular line.

It would have added to the interest of Dr. Stein's work if he had more to say about such relics as exist of the peculiar form of Nestorian Christianity which once prevailed in High Asia, and was coæval with Buddhism. But there is very little more light thrown on this subject than has already been given us by Sven Hedin.

Scientists will await with impatience the fuller records of his discoveries, and the splendid field of philological research to which they give rise. Meanwhile, the ordinary unscientific public will find a most readable summary of these important investigations (which illustrate quite a new chapter in human history) in the book which has just been published. T. H. H.

INDIA IN EARLY MAPS.

'La Cartografia antica dell' India.' By Francesco L. Pullé. Firenze, 1901. (In *Studi Italiani di Filologia Indo-Iranica*, Anno IV. vol. iv.) With an Atlas of Maps.

This is a study of high interest and value. It is divided into seven parts, in which the conceptions of India and its configuration are discussed, as entertained by the ancient Egyptians, Babylonians, Phœnicians, and Jews, by the Indians themselves, by the Greeks, by the Romans and Alexandrians, by the scholars of the 'Lower Empire,' by the Byzantines, and by the Arabs and Persians. Appendices are added on certain special authors or treatises and their account of India—on Pomponius Mela, on Pliny, on the Periplus of the Erythræan sea, on the Anonymous Geographer of Ravenna, and others. Among the larger maps in the 'Atlas' are facsimiles of the sixth-century world-scheme of Cosmas Indicopleustes, according to both the Florentine (Laurentian) and Vatican manuscripts of the ninth and tenth centuries—of the same author's Mountain of the North, according to the Laurentian manuscript—of the Mappe-monde of Fra Mauro (1457–1459), etc. The text is also illustrated by thirty-seven smaller designs, largely modern reconstructions of ancient maps now lost; many of these, as is natural, follow the suggestions already given by that most stimulating inquirer, K. Miller of Stuttgart. Several clarified reproductions of mediæval maps, admirably executed, are also given, *e.g.* Cosmas, the Mappe-monde of Albi, Ibn Haukal, and Edrisi. The whole work is executed in a thorough and scholarly manner, and must be invaluable to every student of mediæval geography; the most recent work of continental scholars has been utilized, though the same cannot always be said of their English contemporaries. It is pleasant, however, to see so keen an appreciation of an essay of remarkable merit, too little known in England, Marinelli's 'La Geografia dei Padri della Chiesa,' long ago translated into German ('Die Erdkunde bei d. Kirchen-Vätern'), but still awaiting an English version. The treatment of India by Ptolemy, by the Periplus of the Erythræan sea, and by Cosmas, are handled by Sig. Pullé in a manner worthy of special praise. This is surely the first time that the world-scheme of the Alexandrian monk has ever been faithfully reproduced from the Vatican manuscript; it had already been photographed in 1897 from the Florentine copy, for reproduction in my own 'Dawn of Modern Geography,' vol i. p. 384. C. RAYMOND BEAZLEY.

PERSIA.

'The Persian Problem.' By H. J. Whigham. London: Isbister & Co. 1903. *Price* 12*s*. 6*d*.

Under the above title Mr. Whigham republishes, in an altered and amplified form, with maps and illustrations, a series of letters contributed by him in 1901–1902 from Persia to the *Morning Post*. The sub-title of the book, "An examination of the rival positions of Russia and Great Britain in Persia, with some account of the Persian Gulf and the Baghdad railway," is a sufficient indication of the object with which it is written. In some of the first twenty-two chapters Mr. Whigham deals mainly with various factors of the Persian problem, *e.g.* our position and prestige, past and present, in the Persian Gulf, Koweit, and the Baghdad railway, the attitude of his predecessors and of the present Sheykh of Muhammerah towards the Persian Governm [illegible] from the Karun to the capital, and the equally important route *viâ* Baghdad and Kermanshah; in others he sketches with a crisp touch the Arab pirate coast, the ruins of Mesopotamia, the sacred cities of Nejef and Kerbelá.

Mr. Whigham has the faculty of presenting in concise and well-chosen phrases a luminous *résumé* of any subject he deals with, whether that subject be a somewhat intricate question of local politics (*e.g.* in the case of Muskat) and its bearings on international questions, or the reconstruction of the Babylon of Nebuchadnezzar's day, as seen in the light of the most recent discoveries of Dr. Koldwey and his fellow-workers, or, again, the exploitation by a British capitalist of the oil-wells of Kasr-i-Shirin.

In the closing six chapters Mr. Whigman sums up the relative positions, political and commercial, of Russia and Great Britain in Persia, and draws his conclusions. "The whole aim and object of our policy in Persia, first and last, should be railways. Russia may have all the political prestige she wants, so long as we control the railways from the Gulf to Tehran."

Since the publication of Lord Curzon's 'Persia' we have seen no work more helpful than Mr. Whigham's for a right understanding of the Persian question. Indeed, it is not too much to say that the volume forms a useful and almost indispensable supplement to that book, bringing it up to date on many points.

G. G.

FORMOSA.

'The Island of Formosa, Past and Present.' By James W. Davidson, F.R.G.S., Consul of the United States for Formosa. London: Macmillan & Co. 1903.

FORMOSA must have been known to the Chinese at a period far beyond the ken of European historians; it is potentially one of the richest islands in the world, and the Dutch settlements upon it were founded so long ago as 1624. Yet, on the whole, the bibliography of the island is a remarkably limited one, and no really comprehensive work on it has been published in any language. In the volume under consideration Mr. Davidson seeks to remedy this omission, and, though it is very far from being complete, as the author himself would probably be the first to admit, it is, at all events, a step in the right direction, and for the large amount of really valuable information which he has got together, whether from his own experiences or those of others, the reader cannot be otherwise than grateful.

Of Mr. Davidson's thirty-one chapters no less than twenty-two are devoted to historical events. Chinese records furnish but few particulars as to the earlier periods, and in later times the Portuguese seem to have been content with naming the island only, for they made no settlements on it. It is with the advent of the Dutch that history really commences, and their occupation and final ejection by Koksinga are treated at some length, as is also the episode of the first Japanese expedition in 1874. The most important, and certainly the most interesting section of the historical part, however, is that descriptive of the Japanese campaign of 1895, which ended in the annexation of the island. Here we have an account of the affair at first hand, for Mr. Davidson was an eye-witness of the reign of terror which prevailed in Taipeh and Twatutia, and, indeed, took a sufficiently prominent part in the events of this most perilous and exciting time to earn him the decoration of the Imperial Order of the Rising Sun at the hands of the Emperor of Japan.

Leaving history for present-day conditions, Mr. Davidson passes to a consideration of the three great industries of the island—tea, camphor, and sugar, to each of which a chapter is allotted. Tea culture is principally confined to the northern part, in the neighbourhood of Taipeh, or, as it is now called, Taihoku, and here it appears to be increasing enormously. The output already exceeds twenty million pounds, but is regarded by good authorities as being still in its infancy, and the quality is of distinctly high average. The importance of the industry may be estimated from the fact that about 86 per cent. of the annual export receipts are obtained from it. Camphor, however, is scarcely less important, although the Government monopoly of the article has not quite proved the success which had been predicted. The increased price obtained led to the cultivation of the tree in other countries, while in Japan the camphor is to be found wild, and in the central and southern provinces of China it abounds, giant trees of 28 feet in circumference being met with. As a result, private individuals were able to undersell the Government, and prices had to be lowered.

The author, seeing that his aim is to make his volume a standard book of reference on the island, might, perhaps, have given the list of Formosan plants which Mr. Augustine Henry published in the *Transactions of the Asiatic Society of Japan*, but he has contented himself with dealing with the economic species cultivated in the island, and of these he furnishes a full account, as in the case of camphor, of which, indeed, the most minute particulars are given. The Japanese Government has been particularly energetic in forwarding agricultural interests, and has already established several experimental stations. The coal measures of Formosa apparently underlie the whole island, and sections descriptive of these, the petroleum, salt, gold, and other mineral products, are appended; but geology as such receives but scant notice at Mr. Davidson's hands. Nor does ethnology fare much better, for though some thirty pages are given to the aboriginal tribes, and Mr. Y. Ino, to whom the author tells us he is mainly indebted for the particulars, has much that is new and interesting, he leaves so much unsaid, that there is evidently no lack of work for future travellers desirous of investigating the anthropological problems of the country. Eight groups of these savages are described, and vocabularies of some forty words of each given in the appendix. It is curious to note, with the exception of the numerals, how slight is the resemblance to Malay. The types of natives, too, so far as can be judged from the very indifferent illustrations, show no likeness to Malays, and the chief feature about them would seem to be—as, indeed, might be expected—the amount of variation. Rather remarkable is the approximation to a Carib *facies* which is noticeable in a number of instances, an *obiter dictum* which we may permit ourselves here without making suggestions as to its cause. Quite one of the most interesting parts of the volume is that in which Mr. Davidson describes the little-known island of Botel Tobago and its inhabitants, which he visited in 1896. He considers that there is a distinct admixture of Papuan blood here, and doubtless there is. But the same might be said of some, if not all, of the Formosan wild tribes, among whom are to be found bachelor houses for the young men, anthropomorphic images, and bows and arrows. Botel Tobago is one of the few places on the globe where tobacco is unknown, and other peculiarities are the dwellings of the natives, and a remarkable breed of long-nosed pigs with long hair on the neck. The houses may be said to be unique. They consist of three separate apartments within a walled and paved compound, one being partly subterranean for winter residence, another a tower-like edifice for protection against the summer heat, and the third of an intermediate nature.

Mr. Davidson concludes with a long chapter on "Formosa of To-day," which deals with the present condition of affairs at some length. That the information is the most recent possible is evident from the fact that his book is written on the spot. It thereby suffers somewhat, the author having been unable to revise the proofs; but the errors are of no great moment. There is a useful appendix on the land birds of the island by Mr. J. D. de la Touche, but the list of mammals is apparently the same as Swinhoe's. Some notes on the climatology follow, from which it appears that Kelung has the heaviest rainfall of any station in the Far East, its average for five years past being 219 rainy days, and over 150 inches of rain. The book is illustrated by a number of quarter-plate photographs, in favour of which not much can be said. The two maps are noteworthy as embodying the latest Japanese explorations, and there is a commendably full index of forty-six pages. F. H. H. G.

THE MONTHLY RECORD.

EUROPE.

The Lakes of Snowdonia.—A survey of the principal lakes of North Wales, mostly situated in or near the Snowdon district, was carried out in 1900 by Mr. T. J. Jehu, late Heriot Fellow of the University of Edinburgh, and this supplies us for the first time with accurate data regarding the under-water contours of most of the lakes, thus doing an important service towards the elucidation of their mode of origin. The results of the survey, with a summary of conclusions based upon them, are given by Mr. Jehu in the *Transactions of the Royal Society of Edinburgh* (vol. xl. part 2), in a paper which, though issued separately in June of last year, has only lately been received in the collected volume. Mr. Jehu begins by sketching previous work of the kind done in this country, and pointing out the importance of a knowledge of the configuration of lake-basins for the solution of the vexed question of the extent to which they can have been excavated by glaciers; afterwards explaining his method of work, describing in turn the individual lakes and their surroundings, and summarizing their general characters and the conclusions to be drawn as to their mode of origin. The method was, on the whole, identical with that employed by Dr. Mill in his survey of the English lakes, rowing-boats and cord sounding-lines being used. The transport of the boats to some of the elevated and remote mountain lakes was a matter of some difficulty, and Mr. Jehu is to be congratulated on his successful accomplishment of the work in spite of such obstacles. During a great part of the time he was single-handed, but a portion of the survey was carried out with the help, firstly of Mr. P. Lake, secondly of Mr. H. Woods, both of St. John's College, Cambridge. We can refer particularly only to the two last sections, in which the main generalizations arrived at are put down. The general summary of the characters of the lakes, which is accompanied by tabulated statistics of the various elements in each of them, shows that five of the lakes lie at comparatively low levels in valleys encircling the base of Snowdon, though their positions within the valleys differ considerably. Others occur more or less close to the heads of upland valleys, while others belong, again, to the class of cirque, corrie, or cwm lakes. Examples of shallow, intermediate, and deep lakes alike exist, and it is noted that the deepest lakes often occur at very high elevations, some of the corrie lakes lying in crater-like hollows. Of the valley lakes, Cawlyd (maximum depth over 200 feet; mean over 100), Peris, and Cwellyn exceed 100 feet in depth. Padarn, Peris, and Cwellyn lie in trough-like hollows, while other valley lakes show more basin-shaped cross-sections. The deepest portion of lakes of this class, as has been so often found elsewhere, frequently lies towards the head. In regard to the mode of origin, Mr. Jehu has no doubts as to the power of ice to excavate lake-basins, and accepts without reserve the views of

Penck and Davis as to the "over-deepening" of main valleys by ice as the explanation of the existence of hanging valleys.[*] His soundings, which have shown that in many cases the lakes are deeper than has been supposed, certainly seem to prove that a number of them are true rock-basins, and that they are not, as Mr. Marr suggested, bounded in part by drift-filled depressions. But his explanation of the mode of action of the ice is not always convincing, and savours sometimes of a *petitio principii*. Thus it is assumed throughout that where the ice accumulated above an obstacle a deepening of the valley would result, no attempt being made to remove the difficulties many feel in accepting this as proved.

The Relict Fauna of the Furesö, Denmark.—The Furesö lies north-west of Copenhagen at a distance of 5½ miles from the Sound on the east, and 10 miles from the Roskilde fiord on the west. It has an area of more than 2400 acres; its surface lies 66 feet above sea-level, and its bottom 62 feet below. On most sides it is bordered by hills rising to a height of about 65 feet above the water. The little lake Vejlesö has been cut off from the lake, and the large gulf of the Furesö, the Store Kalven, is undergoing the same process of separation. The chief affluent of the lake is the Mölleaa, 24 miles long, which, after passing through the Furesö and other lakes, enters the Sound. Much of its water is drawn off for use in factories, and the bed is silting up. Dr. C. Wesenburg-Lund has found in the Furesö a relict fauna consisting of two groups, the earlier of arctic origin and including *Mysis oculata* var. *relicta* and *Pontoporeia affinis*. Since the discovery of an arctic marine fauna in the Swedish lakes by Messrs. Cederström and Videgren in 1860, there has been much discussion regarding relict lakes, some naturalists maintaining that every lake containing a pelagic fauna must have had direct communication with the sea during some period of its existence, and have been subsequently cut off by an elevation of the land, whereupon the marine fauna has gradually adapted itself to life in fresh water. M. de Geer, however, affirms that the modification of marine forms took place in a large lake, which towards the end of the glacial period occupied the basin of the Baltic, and was gradually shut off from the ocean; while Prof. Credner points out that in many cases marine organisms have ascended rivers and traversed lagoons, gradually adapting themselves to new conditions on their way to the fresh waters in the interior. Proof that a lake has formerly formed part of the ocean must be furnished by geology. With regard to the Furesö basin, Dr. Wesenberg-Lund concludes that, whatever its origin, it had received its definite form when the beds containing *Dryas* and other polar plants were deposited, and was not sensibly modified during the successive vegetations of the birch, pine, and oak. The oldest representatives of a marine fauna (*Valvata*, *Bithynia*, etc.) date from an epoch long before the glacial period, and their origin is quite unknown. Two forms, at least, *Mysis oculata* and *Pontoporeia affinis*, probably accommodated themselves to fresh water in the Baltic when that sea was the *Ancylus* lake, and survived in the inland lakes when salt water again penetrated into the Baltic. Immigration took place at first both from the west and east coasts, but ceased on the west during the oak period, when the sea retired from the deep erosion valleys, while on the east it continued till interrupted by the action of man. The other marine forms in the Furesö have probably immigrated in more recent times.—*K. Danske Vidensk. Selskabs Forhandl.*, No. 6, 1902.

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[*] Hanging valleys are generally attributed to the protection afforded by the ice which is supposed to have formerly filled them. May not some at least, however, be due to the protective action of the ice in the *main* valley, which would temporarily raise the base level of erosion, in their case, to that of its own surface, at the same time preventing the accumulation of *débris* on the valley-flanks below that level?

Ignazio Danti's Map of Perugia and District.—A photographic reproduction of the map of the district of Perugia, drawn in 1577 by the Italian cosmographer, Padre Ignazio Danti, appears in the *Bolletino* of the Italian Geographical Society for April-May last, accompanied by letterpress by Prof. A. Bellucci. The map, which is now the property of Colonel C. Cherubini, was based on a survey by Danti himself, and is one of the earliest examples of Italian local topographical maps in existence, while a further interest attaches to it on account of its author's services to geography in other directions. Prof. Bellucci says less than could be wished as to the circumstances which led to the production of the map (which was engraved by Castari in 1580), but as he is preparing for press a detailed work on early Italian topography, more will no doubt be said on this subject later. He also says little as to Danti's other work as a geographer, and as this is perhaps less familiar to the public than that of other Italian geographers of the time, a few notes on the subject may not be out of place here. Danti is best known from the part which he took in the preparation of some, at least, of the maps painted on the walls of the Logge di Raffaello at the Vatican, which include an important one of Italy as it then was. He did this work in the capacity of cosmographer to Pope Gregory XIII., whose interest in geographical studies is well known. (For a description of the maps see Thomassy's series of articles on "Les Papes Geographes" in the *Nouvelles Annales de Voyages* for 1852–53.) He also designed the maps painted in the "Guardaroba" of the Palazzo Vecchio at Florence, which, like most of those at the Vatican, bear a strong resemblance to the sets of maps given in contemporary Italian versions of Ptolemy. In an allied field Danti did important work in connection with the revision of the calendar and the construction of the first gnomon capable of being used for astronomical observations, while his name has been drawn into the recent discussion on the Toscanelli-Columbus correspondence from an erroneous statement which he made on the subject in his edition of the *Sphæra Mundi* of Sacrobosco. In connection with Danti's map of Perugia, Prof. Bellucci gives information as to various old lists of forts and towns in the district, one of which, dating from 1580, or the year in which the map was engraved, he gives in full for purposes of comparison.

ASIA.

Mining and Forestry in Asiatic Turkey.—A recent consular report, printed by the Foreign Office (Miscell. Series, No. 589) gives some interesting details respecting the present condition of mining and forestry in Asiatic Turkey. It deals with the various provinces in turn, passing under review the principal mines and known deposits of minerals in each, as well as the extent of forests, the methods of working them, and the principal trees represented. Taking the mines throughout the whole territory first, we note that while everywhere a great variety of useful minerals appears to exist, the conditions of the country at the present day are such that few of the deposits can be worked with much prospect of financial success. The hindrances to mining enterprise in the vilayet of Sivas are summed up as "lack of capital, bad roads, absence of cheap transport, and unfavourable Government attitude," and these conditions seem to apply with greater or less force throughout the country, though in some districts, as, *e.g.*, in the Adana vilayet, carriage does not present quite the same difficulties, the most serious obstacle being the present state of the administration and mining laws. The minerals most commonly spoken of are chrome, silver-lead, antimony, manganese, arsenic, emery, copper, iron and iron pyrites, silver, zinc (calamine), coal, though many others also occur. In the Smyrna consular district the most active workings are of chrome, emery, calamine, and silver-lead, the principal ports of shipment being

Smyrna, Makri, and Kulluk. Other minerals which exist, but are at present worked in small quantities, if at all, are manganese, arsenic, copper, iron, lignite, etc. Chrome, silver-lead, and manganese are worked in the Adana vilayet, silver-lead in that of Sivas, bitumen in Syria, while in the vilayets of Aleppo, Erzerum, Trebizond, little is yet done to exploit the mineral wealth, though in the last-named coal must before long be more extensively worked in view of the almost entire absence of other fuel-supplies. With regard to forestry, while neglect and maladministration seem fairly general, the condition of the forest differs much in the different vilayets. In that of Aidin (Smyrna), their area is estimated at 2½ million acres, the principal trees being pine (*Pinus sylvestris*), oak (*Quercus pedunculata* and *Q. robur*), styrax, larch, etc. In the Sandjak of Adalia they cover nearly 900,000 acres, the pine being here the *Pinus maritimus*, which occurs up to 1500 feet. The forests are, however, in general little worked, and the Smyrna timber market is mainly supplied from abroad. The forests of Murad Dagh and Aghar Dagh in the vilayet of Brussa, and of Kaz Dagh, which extend beyond the limits of that vilayet, are very valuable, and offer good facilities for working. Those of Mount Amanus, in the Aleppo vilayet, produce noble specimens of "Aleppo pine" and fir; while the rich and extensive forests in the vilayet of Adana still produce magnificent timber, though the cedars of the Cilician Taurus are fast being exterminated. The forests of Lebanon have been considerably reduced by improvident cutting, which the Government can do little to prevent, and in the vilayet of Beirut the fine forests which existed thirty or forty years ago are rapidly disappearing. In Erzerum, again, the denudation is all but complete in the eastern portions, the poplar and willow plantations around the villages alone remaining. In the Trebizond vilayet, forest covers nearly 1½ million acres, but the two saw-mills which have been established have not proved very profitable.

Exploration in Mongolia.—According to a telegram from the *Times* correspondent in Peking, dated September 18, an interesting journey in Mongolia has been made this summer by Mr. Claude Russell, second secretary of the British Legation, accompanied by a son of Sir Michael Hicks-Beach. The expedition left Peking on July 20, and, passing through Jehol, struck north to the Manchurian railway at Tsitsihar. The route lay east of the Khingan range, and covered a distance of 1000 miles, parts of it being, it is thought, through country previously unvisited by Europeans. It will thus form an interesting supplement to Mr. Campbell's recent journey, though it is hardly to be expected that the new geographical matter can be very extensive, coming from a country which has been so frequently visited by Russian explorers. The party met everywhere with a most cordial reception.

Recent Visits to Lhasa.—In 1899 the Council of the Imperial Russian Geographical Society provided O. M. Narzunof, a Kalmuk by birth and a Buddhist by religion, who was going to Lhasa, with a camera and a number of plates. At the same time the Buriat Zibikof was also in Lhasa taking photographs for the Society. Lists of their views are given in the *Izvestiya*, vol. xxxix.—published also under a separate cover—and seven of Narzunof's views are reproduced, showing Lhasa, the Potala or palace of the Dalai Lama from various points, the palace of the old kings of Tibet, and a couple of monasteries. Lhasa has also been reached by a Japanese named Kavagushi, who, leaving home six years ago, spent some time at Darjiling learning the Tibetan language, and was thus able to pass for Lama and live on intimate terms with some of the most influential personages in the city. His disguise was at last detected, but he made his escape through the aid of a friend.

First Ascent of the Volcano Mayon in the Philippines.—This famous volcano was ascended to its summit for the first time last year by two out of a party of five Americans who started from the village of Guinobatan on the afternoon of March 15. A short account of the ascent appears in the *Sierra Club Bulletin* for February of the present year. The night was passed at an elevation of 1500 feet, and the actual ascent began at 5.30 on the morning of March 16, the way leading up a narrow trail through dense tropical vegetation. At 9.30 the party reached the edge of a deep gorge, beyond which there was no vegetation, the slopes above alternating between rock and shifting sand, with frequent deep gorges. At 11 a.m. an altitude of 6500 feet had been gained, and here one of the Americans gave up the attempt, a Spanish doctor, who set out with them, having previously desisted. The slope became excessively steep, and the mountain was now a conglomerate of lava and great boulders, quite devoid of life. At 1000 feet below the summit two more of the party desisted, leaving two only—Lieut. Barton and Mr. Bubar—to continue the ascent to the summit. During the last 250 feet the top of the mountain had been rent into hundreds of clefts and holes, through which steam constantly escaped. The highest point is 8900 feet above the sea, the edge of the crater being a mass of black volcanic sand and pumice, with outcrops of white and red rock. The crater is about 200 yards in diameter, and at a depth of 100 feet the vent decreases to 50 feet, the steam escaping as though under pressure.

Further Explorations in Celebes by Messrs. Sarasin.—The energetic explorers of Celebes, Messrs. Paul and Fritz Sarasin, have added to their previous exploits the crossing of the hitherto almost unknown south-eastern peninsula of the great island. In 1902, it will be remembered (*Journal*, vol. xxi. p. 454), Messrs. Sarasin had made an important journey across the western centre of the island, and their latest expedition was undertaken early in the present year. Starting from Mingkoka bay in the Gulf of Boni on February 20, they struck eastward, and reached the Bay of Kendari on the East Coast on March 12, after a successful journey. According to a note in *Globus* (vol. 83, No. 22), the main physical features of the peninsula are as follows: Both on the east and west sides a system of mountain chains runs nearly north-west and south-east, sinking to sea-level in the south, but joined northwards to the high chains of the Sussua and Tobungku mountains respectively. A trench-like depression between them is partly occupied by a vast swamp, Lake Opa, which is drained by the large river Konaveha. This rises in the north, and breaks through the eastern range to the Bay of Sampara. The valleys of the western range were flooded by the heavy rains, and the travellers had frequently to wade through the water. Reaching Lambuya, at the eastern foot of the mountains, they went south to the Opa swamp, and then struck north-east across its northern extension, a deep sago-palm morass, through which they had to wade for three hours, afterwards crossing the eastern chain and the Konaveha river. Among the slaves of the Buginese on the west coast, a low type of natives was seen—dark, broad-nosed, and of low stature—said to come from the island of Muna. In the interior the people were likewise of small stature, but light in colour, and having often the characteristic Malay eyes. Nearer the East coast dwell the Tolalaki, a much-dreaded tribe of head-hunters of Toraja affinities, big-made men, resembling the Buginese. Ethnological research was, however, hindered by the general flight of the people through fear that the expedition was a warlike one. Evidence is said to have been obtained that no former land connection existed between the south-east peninsula and neighbouring lands, as was the case with the other peninsulas.

AFRICA.

Hydrography and Economics of the Nile Basin.—As the fourth number of a new German series of monographs on 'Applied Geography,' edited by Prof.

Karl Dove ('Gebauer-Schwetschke Druckerei,' Halle a. d. Saale, 1903), Dr. H. Henze has written an elaborate account of the hydrography and economic relations of the Nile. The writer has consulted a large number of authorities, and although there is nothing very original in his point of view, it is useful to have the main facts thus brought together in a convenient form. The study would, however, have been of more value if more care had been taken to make use of the latest available information. The main sources have certainly been drawn upon down to some three years ago, but there is a surprising absence of reference to some of the latest authorities, at any rate at first hand. Thus the official reports of the Egyptian department of public works, which contain so much valuable information on irrigation, hardly appear to have been consulted, though copious reference is made to Sir W. Willcocks's work on irrigation in Egypt, which of course embodied much of the information down to the date of its publication. In describing the hydrography of the Nile, Dr. Henze follows in the main the lines of the paper by M. de Martonne in the Berlin Society's *Zeitschrift* for 1897 (see *Journal*, vol. xi. p. 548), to which he often refers, but he has left out of view much of the work that has been done since. In describing the headstreams of the Nile, he, strange to say, makes no allusion to Dr. Kandt's surveys of the upper branches of the Kagera (to say nothing of M. Dècle's examination of the southern branch), nor when speaking of the *régime* of the Victoria Nyanza does he make any mention of the observations of level carried out in Uganda and discussed in the British Association Reports on the Climatology of Africa; while the rainfall data for Uganda contained in the last of these (1901) have also not been consulted. The results of Commander Whitehouse's survey of the shores of the Victoria lake are ignored, and valuable papers like that of Captain Herrmann in Danckelmann's *Mitteilungen* for 1899 are not alluded to. Probably the paper was written before the publication, in the *Annales de Géographie*, of Captain Dyé's important paper on the Bahr-el-Ghazal system, but we should have expected fuller information to be given respecting the results of the recent sudd-cutting operations. Of the earlier authorities good use has been made, and the copious references to these which are supplied will be a help to those who desire to pursue the subject further. In the section dealing with the economic importance of the Nile, the want of up-to-date information is not so noticeable, and the paper supplies a useful summary of the part played by the river in relation to agriculture and communications in Egypt and the Sudan.

The Okapi.—It is pointed out by P. Hesse in the *Naturwissenschaftliche Wochenschrift* for July 12 last, that the skin of an unknown animal was obtained by Junker when at Zemio, in the Welle basin, under the name Makapi, and the plausible suggestion is made that this really came from a young individual of the recently discovered okapi. The skin was devoid of head and feet, so that its accurate determination was impossible. The size was that of a dwarf antelope, but the colour was reddish-brown, with dark tips to the hairs, and bands of white from the neck to the flanks. The animal was known to but a few of the A-Zande, and its habitat was said to be a swampy tract in about 6° N., 25° E., or not far distant from the equatorial forest. The swampy nature of the habitat seems certainly to favour Junker's identification with the *Hyæmoschus aquaticus* of the dwarf musk-deer group (*Tragulus*), or an allied species, rather than with the okapi, while the resemblance of the name and the locality from which it was obtained lend some support to Herr Hesse's suggestion. Junker's account of his animal is to be found in vol. iii. of his 'Travels in Africa' (German ed., p. 299; English ed., p. 268).

Disappearance of Lake Shirwa.—The drying up of Lake Shirwa, or Chilwa, which, as is well known, has been in progress for some years, seems now to be virtually complete, to judge from a note inserted in the missionary publication

'Life and Work in British Central Africa' for June last. All that can now be seen of it from the former Mchisi island is a pool at the old crossing on the west side, and small shallow pools at the mouths of the large streams. The canoes which the natives have used on the lake from time immemorial are left high and dry on the sun-baked mud, while it is possible to go on foot to Tongwe, the smaller inhabited island. The mud is still soft in places, but the surface quickly dries hard, and the grass which has sprung up is dry and yellow, and grass fires constantly occur. A small well near the mission school on the island supplies the natives round with water, which is good, although the lake-water is or was brackish. Food-crops on the island are very poor on account of the drought, and many of the people are emigrating to the Zomba district.

The Lower Ogowé Country.—It is probably not sufficiently realized to what extent our knowledge even of districts close to the African coasts or well-frequented routes into the interior lacks accuracy and precision as regards the details of their topography. The lower Ogowé is a case in point, for, as is shown in the *Annales de Géographie* for March 15 last, by Mr. Ernest Haug, a missionary who has spent a number of years in the country, existing maps of this region are entirely inaccurate regarding all but the main course of the Ogowé itself, the complicated system of lakes and interlacing streams connected with it being very little known. Mr. Haug has, during his frequent journeys, paid special attention to the topography of the district, and gives the results in the form of notes, accompanied by an excellent map, in the Journal above alluded to. Mr. Haug's map is referred to the longitude of Lambarene accepted in the official map of the Service Hydrographique (though, as he points out, its correctness is not quite certain), the details being filled in from his compass surveys, made, as a rule, in closed circuits. One of the principal geological formations, especially to the north of the main river, consists of horizontal strata of calcareous (sometimes sandy) marl, which seem probably of Upper Cretaceous age, though the surface in the direction of the sea is composed of sandy savannas, presenting parallel undulations which have all the appearance of having once been dunes since fixed by the growth of *gramineæ*. The borders of the southern lakes, and of the Ogowé itself, are formed of laterite, which has been erroneously supposed to occupy the whole region. A study of the orographical features is extremely difficult on account of the dense covering of vegetation and the entire absence of paths. Generally speaking, the elevations of the surface run in lines parallel to the coast, the lacustrine region lying between the Lambarene range (highest point 800 feet), which is connected towards the south with the Ntyankolo mountains, and the coast ridges. After passing through the Lambarene range the Ogowé sends off divergent arms, which, before again uniting with the main stream, collect the water of two principal series of lakes, one to the north, the other to the south. The former is still little known; the latter consists of the three lakes of Onange, Ogemwe, and Ezanga (with a few smaller ones), forming together a basin of very irregular outline, which has hitherto been very incorrectly shown on our maps. The streams which connect the lakes with each other and with the Ogowé are deep and of a generally uniform width and current, while the main river varies greatly in width and is often blocked by sandbanks. The lakes form a system of natural regulators of the flood-water of the Ogowé, which sometimes reverses the current in the outlet of the southern lakes, the level of the latter then rising rapidly. Apart from the so-called plains of the coast region, the whole country is covered with dense forest, in which animal life (including the gorilla and chimpanzee) is fairly abundant, though not often seen. The human inhabitants, who came originally from the interior plateaus, have become thoroughly acclimatized to this region of lakes and rivers, and hardly travel at all except by water; but though their villages are always placed near the water, care is taken not to remove too far from the rising grounds on which the plantations are made. They may be divided into three main groups, viz. those of the Seki and Bakele, the Mpongwe, and the Pahuins, or Fan, which correspond to three successive immigrations.

The Oranese Sahara.—The well-known French geographer, M. E. F. Gautier, who has done so much to extend our knowledge of Madagascar from a scientific point of view, undertook last year a journey into the western part of the Algerian Sahara, lately brought under French influence. The results of his studies, which are a valuable addition to our knowledge of the physical history of the region, are summarized in the *Annales de Géographie* for May 15 last. M. Gautier says that the Sahara proper may be held to begin a little to the south of Figig, which itself belongs rather to the Atlas. The Wed Zusfana, which runs south-west from Figig, soon enters a region dominated, in contrast to the jagged summits of the Atlas (of Secondary age), by horizontal plateaus of carboniferous limestone, which constitute the horst against which the northern chain has been folded. In its upper, wider part the valley forms a level plain of quaternary alluvia, into which the water sinks, so that not a single oasis exists, the only trace of former occupation being at the northern edge. Lower down the valley narrows, and we find a group of oases, of which the largest is Tarit, brought into being by the outcrop of the impervious carboniferous limestone, which brings to the surface the excellent water contained in the great dunes to the east. This region shows abundant signs of ancient habitation. Before Igli is reached the horizontal quarternary strata reappear, though pierced by "gur" of carboniferous limestone, on one of which the post itself is placed. Igli owes its importance to its position just below the junction of the Zusfana with the Gir, from the latter of which it derives most of its water-supply. M. Gautier urges the advantages of the valley of this wed over that of the Zusfana as the route for the future railway, its people showing signs of much relative prosperity, besides being generally amenable to authority. A little beyond Igli a new geological region is again reached, the character of which has not been sufficiently recognized. It differs in the age and character of its rocks, which are Devonian, but still more in the presence of an important series of folds, which leads M. Gautier to speak of it as the Hercynian chain. Along the Wed Saura the folds run regularly north-west and south-east, but in the Gurara region the direction varies. There are also frequent horizontal strata, the age of which is difficult to determine, but which seem in part at least to be Cretaceous. They are important from their water-bearing character, and it is their contact with the Devonian rocks which determines the distribution of vegetation and human life. Even along the Saura and the Sebka of Gurara the water-supply is not derived, as might be supposed, from the wed and Sebka themselves, but owes its existence to the erosion of the depressions, which has cut down the superficial strata to the level of the impermeable Devonian. It is obtained, not from wells, but from springs, which the people utilize by the construction of underground conduits, or "fgagira." This explains the fact that all the oases lie on the east side of the two depressions. A broad natural distinction can thus be drawn between the three subdivisions of the French Sahara. At the two extremities (Wargla and Gurara) there is a fairly abundant water-supply, but whereas it is artesian in character at Wargla, owing to the plunging of the water-bearing strata, at Gurara it is brought to the surface by the outcrop of the impervious Devonian rocks. The central region, or Algerian Sahara proper, has no such advantages, though, strange to say, it is that on which, in the blind effort for expansion, French effort has been principally directed. The writer, while allowing that Gurara possesses only limited resources, and is at a disadvantage as compared with Wargla, does not consider the fear that it will become depopulated as likely to be realized. The shortness of the labour-supply, however, stands in the way of its development. M. Gautier carried out observations for longitude which seem to show that all the positions require to be shifted considerably to the east. It should be mentioned that during the present year he has made an interesting trip to the Muidir plateau, of which we hope to say more later.

Economic Provinces of the Sahara.—In a dissertation for the degree of Doctor at Jena University, printed last year at Wolfenbüttel, Herr Dürkof endeavours to subdivide the Sahara into provinces on the basis of principal vegetable products either exploited by the natives or exported to foreign markets. He starts from the definition of the desert, not as a region with such-and-such minimum of rainfall (the important factor being not so much the actual amount of this as its distribution through the year), nor as one from which there is no surface drainage, but as a region in which the scarcity of rain, and, as a consequence, of vegetation, renders it unsuited for the abode of man, either continuously or for short periods, by reason of the absence of the necessary vegetable food for himself and his flocks. He therefore regards as forming a separate category such tracts as afford more or less pasturage, classing these as "Wüstenweide." He does not, however, press this distinction to its logical issue, for among the economic products of the desert, a large proportion are such as supply articles of food, and are in fact produced rather in the oases and bordering steppe regions than in the desert proper. By excluding from consideration the various fodder-plants, he likewise omits one of the most important factors in the domestic economy of the Saharan peoples. After a very brief consideration of the conditions of rainfall and plant-growth in the Sahara, in the course of which he points out that it is the ground-water rather than the actual rainfall which determines the distribution of vegetation, the author proceeds to describe the nine different provinces which he defines on the basis of their economic vegetable products. The most extensive and important are those of gum arabic, alfa, and the date palm, each of which is again divided into sub-provinces. Gum arabic is produced, *e.g.*, chiefly in Northern Senegal, the steppes of the Nile basin, and in South-West Morocco, while the principal subdivisions of the date-palm province are—the Algerian Sahara, Fezzan, Tripoli, and the Nile valley and Libyan desert. Products of secondary importance which are taken as characterizing definite provinces are senna (in Air) and colocinth and "Siwah" (Tibesti, Borku, etc.). As is natural, Herr Dürkop's provinces overlap to a considerable extent, for Tripoli, to take one instance only, falls both to the "Alfa" province and to that of the date-palm. Yet the author has to some extent adopted a purely topographical basis, three of the provinces laid down being not especially marked by the presence of any one characteristic plant, but seem to be defined merely to complete the consideration of the whole area. These, as well as the main provinces, produce various plants of minor economic importance, some, like *Hyphæne thebaica*, *Balanites ægyptiaca*, *Zizyphus jujuba*, and others, supplying both wood and fruit, while many others supply accessory articles of food in times of need.

AMERICA.

Geology of the Sierra Madre of Mexico.—In a reprint, recently received, from the *Transactions* of the American Institute of Mining Engineers, Mr. W. H. Weed describes the geology of the Sierra Madre region as studied by him during a journey across the highlands from Parral to the Gulf of California *viâ* Guadalupe y Calvo. In Chihuahua at least the Sierra Madre is a great plateau rather than a mountain range, though it is trenched by deep cañons in its centre, and dissected into a rugged complex of mountains along its western borders. In the east its elevation is about 7000 feet, while near the continental divide it reaches a height of 10,500 feet, gradually falling to about 6800 feet in the west, where the plateau breaks up into the bordering mass of mountains. It is built up of successive flows of eruptive lavas, principally dacites and rhyolites, the results of great outbursts such as formed the great rhyolitic fields of the western United States. On the east these rocks rest upon folded slates, but in the west the underlying rocks are principally andesites, of direct volcanic origin, forming an irregular plateau comparable to the range east of the Yellowstone Park, and deeply dissected before the date of the rhyolite eruptions. The ore-deposits for which this part of Mexico is famous occur only where erosion has laid bare the andesite, the rhyolite flows having taken place at a time subsequent to their formation. The plateau is fringed by mountains on the east, the foothills being covered with scrubby oak bushes, while in the higher parts both oaks and pines of a fair size occur. On the rhyolite plateau further west water is relatively scarce, the few streams being shallow, and showing, in the dry season, merely isolated pools of water. Trees still occur on the low hills and bossy outcrops which diversify the surface, but the largest specimens are seen on a basalt-covered area beyond the cañons of the Nivarra and Riparra, which is described as an ideally beautiful timber country. Westward of this, the elevation decreases towards the cañon of the Rio Verde, the gorge of which is about 2000 feet deep, though only at its base are the cliffs vertical. The barometer showed 7300 feet at the river-crossing. Looking westward, the front of the plateau is seen as a black straight profile, having no resemblance to a mountain region, though it is commonly called the summit of the Sierra Madre. A little west of the deep basin in which Guadalupe y Calvo is placed the great plateau suddenly ends, and the sea of mountains formed by the erosion of its western border begins. Unlike the eastern mountain rim, which is narrow and elevated, this zone of perhaps 15 miles' width is generally lower than the plateau, and is made up of lateral spurs and ridges transverse to its border. Here cuts of 3000 to 5000 feet prevail, and the abrupt descent from the plateau summit is accompanied by a corresponding change in the vegetation. The Bazonopa, a large branch of the Sinaloa, cuts a horseshoe cañon some 60 miles long through the heart of the mountains, and displays the geological structure well, granite and diorite, as well as andesites, being here laid bare.

AUSTRALASIA AND PACIFIC ISLANDS.

Geological Investigations in the Gulf of Carpentaria.—A report on a visit to the west coast of the Cape York peninsula and some of the islands in the Gulf of Carpentaria, by Mr. C. F. V. Jackson, assistant Government geologist, has been issued by the Queensland Department of Mines as Geological Survey Report No. 180 (1902). The geology of this region has hitherto been imperfectly known, and Mr. Jackson's investigations, made during a voyage in company with Dr. Roth, the northern Protector of Aboriginals, will enable some corrections and additions to be made to the geological map of the state. The Upper Cretaceous "desert sandstone" formation extends southward through the peninsula, save for a small area of older quartzites, etc., for nearly 400 miles to the Mitchell river. In the north it forms the coast-line (the cliffs at Vrilya point being nearly 80 feet above sea-level), but further south its western escarpment recedes for some distance, the actual coast-lands consisting of low, timber-covered flats with frequent sand-dunes. Associated with the sandstone, which in its upper portion is ferruginous, there is a deposit of pisolitic ironstone, which seems to extend more or less continuously northward to the north point of the peninsula, and which Mr. Jackson considers may contain ores of some value. From the recently established Weipa mission station on the Embley river, a trip was made into the interior, as far as the Moreton telegraph station, several large creeks not marked on our maps being discovered. The desert sandstone, which further south forms the barren mulga ridges and isolated flat-topped hills which characterize western Queensland, here presents a quite different aspect, owing to the large annual rainfall (55 inches). The country is well timbered with eucalyptus, tea-tree, etc., and the surface is luxuriantly grassed. In the vicinity of the Mitchell river (which enters the sea by several mouths) the coast is low and sandy, and apparently subject to inundation by the sea. Similar country extends right down to Normanton, the coast running in a long unbroken line devoid of prominent landmarks, and invisible from the deck of a vessel at a distance of 6 miles. It is fringed with mangroves, which by their seaward growth form a barrier, behind which are vast salt-pans and marshes. These mangroves exercise a most important influence on the physical history of the coast, the salt-marsh and salt-pan country extending along it as far as the western boundary of the state. A visit was paid to Sweer's island and Bentink island, between which lies Investigator Road, once proposed as the main port for the Gulf of Carpentaria, though the idea has long since been abandoned. Sweer's island is in part composed of a recent calcareous sandstone, formed of sand blown up by the wind and consolidated by the large proportion of calcareous and other cementing ingredients. It is well timbered in places, and fairly well grassed, and supports sheep and goats, the property of two or three men who reside on the island. It is now not visited by natives, whereas the neighbouring Bentink island is inhabited by a considerable number of blacks, who live in a most primitive style, their camps consisting merely of low barriers of grass for protection against the wind. Both here and at Sweer's island numbers of stone fish-traps were seen along the coast, but attempts to obtain a view of the natives were quite unsuccessful, though Dr. Roth had managed to do so during a former visit to the island.

The Queensland Weather Bureau.—We lately referred to the difficulties in which the Queensland Weather Bureau was placed owing to the refusal of the Federal authorities to supply the necessary funds for its upkeep. It was hoped, however, that, with the help of temporary grants by one or two of the states, the good work done by the bureau might be continued until some permanent arrangement could be made for the inauguration of a Government meteorological department for the Australian Commonwealth. Fresh difficulties have, however, arisen, and we regret to learn that Mr. Wragge, whose name has so long been associated with the work of the bureau, has been forced to sever his connection with it. The bureau will not be closed entirely, but has been taken over by Mr. Henderson, the hydraulic engineer. The work will, however, be much restricted in scope, being limited to the record of rainfall and other meteorological observations, the forecasts, which have hitherto been a special feature in the undertaking, being henceforth abandoned.

The Alleged Disaster to a French Expedition in New Guinea.—Early in 1902 a report was circulated that a disaster had occurred to a French Scientific Expedition in New Guinea, of which several members were said to have been murdered by the natives of the south coast, near the British and Dutch boundary. Circumstantial details were supplied, and went the round of many of the geographical publications on the continent, a reference being made to the supposed facts in our own *Journal* for June, 1902. It now appears that the whole story was purely a newspaper fabrication, no such expedition having even visited New Guinea. Inquiry was made by the British authorities at Port Moresby of the Dutch "Controleur" at Merauke, the district in which the alleged massacre was supposed to have taken place, and we are informed by the Government secretary at Port Moresby that the result has been to show that the whole story was entirely untrue.

Visit to Dutch New Guinea.—A few details concerning the Humboldt and Tanah Merah bays, from the report of the officer in command of the Dutch man-of-war *Ceram*, are published in the *Bijdragen tot de Taal- Land- en Volkenkunde van Nederlandsch Indië*, 1903, Nos. 1 and 2. The Humboldt bay is begirt on all sides by steep-flanked mountains, except on the south-east, where lies the flat country of Sko, from which rises the low range of the Bouganville mountains. The inner—Yautefa—bay is separated from the outer bay by a narrow, low, and sandy landspit planted with oil palms. The appearance of the bay shows that agriculture cannot be the chief occupation of the natives, and the chief villages, Taubadi and Engeros, are situated opposite one another just within the Yautefa bay, and are built over the water. The houses are of pyramidal form, and are bordered by galleries from which the inhabitants can descend into their canoes. The most conspicuous building is the karewari, or rum-seram, a temple in which religious rites of some kind or other are performed. The men of Nafri, on the south-east coast of the bay, are clearly of a different type, and have a more attractive appearance. The houses being all connected with the shore, the life is somewhat different and the language is not the same as in the other villages. The type in the Sko country is in many respects similar to the Yautefa, but the men are less forbidding. Whereas the Yautefa men wear no covering, the Sko men always wear a hollowed gourd, like all the other natives east of Humboldt bay. South of the Cyclops mountain lies the Sentani lake, a sheet of water of very fantastic outline, and sinking to a maximum of about 150 feet. The people speak a language closely allied to that of Nafri, and have much in common with the inhabitants of that village. Whereas, however, the latter go little upon the water, the Sentani people are exceedingly skilful with the paddle. They catch fish in the lake, and keep pigs. Several villages stand on the coast along the foot of the Cyclops mountain, one of which, Orum, is noted for its axe stones, obtained from a quarry in the mountains. The natives of Tana Mera bay are quiet and peaceful, and seem to be more civilized than those of Yautefa. They live more by agriculture than by fishing. They have no rum-seram, and no religious forms have been observed among them. With the inhabitants of the adjoining mountains they live on good terms, bartering fish for their sago; but with the Manemboal, further inland, they do not agree so well. Much information is given in the report on the manners of the natives, their weapons and implements, their ornaments and tattooing, etc. Several illustrations and a map accompany the article.

Journey from Geelvink Bay to McCluer Gulf.—In 1901 the controleur, P. E. Moolenburgh, crossed New Guinea where it narrows down between Geelvink and McCluer gulf. His narrative, printed in the *Tijdschrift van het K. Nederl. Aardrijksk. Genootschaf*, No. 2, is more easy to follow with the help of the map in No. 3, compiled under the direction of Mr. J. F. Niermeyer. From Karwan on Geelvink bay Mr. Moolenburgh crossed a range 1600 feet high or more, and descended on the other side over very rough ground, reaching, at 4 p.m., Woroboï, on a tributary of the Yakati river. He then descended in a boat to the Yakati and up the Sollong to Manggoï on the Yense or Inse, and, returning to the Yakati, visited the village Inse on the estuary of the united Yakati and Inse on Modan island. On the return journey he ascended the Yakati for some distance further, to a place called Sainuri, and reached the coast to the east by an easy route terminating on Geelvink bay at Adimawan, some distance north of Karwan, having spent seven days on the whole journey. Steamboats of small draught could probably ascend at high water to Sainuri. The woods on the banks consist of sago and dammar bushes, and wild nutmeg of inferior quality, but yielding excellent timber. The fauna is poor; birds of Paradise and rhinoceros birds, marsupial rats, pigs, and kangaroos were observed. Coral formation occurs at the highest points. Mr. Niermeyer remarks that it is now established that the Yakati is not a mere salt-water creek, but a river, though perhaps not the only drainage channel of the country. His map is compiled from a recent rough marine survey of the Gulf of Bintuni (eastern part of McCluer gulf), the survey of the *Gazelle*, the map of Hondius van Herwerden, and that of Dr. A. B. Meyer, who in June, 1873, crossed the isthmus. On the whole, they agree fairly with Herr Moolenburgh's map, but it is singular that the places on the Yakati recognized on Meyer's map lie on the part of the river running north and south, whereas both in the map and text Meyer makes the river run east and west. If, however, his map be turned through a right angle, the upper river runs, as Moolenburgh states, from the hilly country to the west.

POLAR REGIONS.

Arctic Expeditions.—Commander Peary continues to show an indomitable perseverance in his endeavours to achieve the conquest of the north pole. He has obtained three years' leave from the Navy Department, and hopes to start once more for the north at the beginning of next July. He will employ a new steamer, and proposes to establish a permanent base at Cape Sabine, pushing his way thence to Grant Land and there taking up winter quarters, the final start for the pole being made in the February following. His plan is to use dog-sledges with light loads for the advance party, which will be supported by a larger, more fully equipped party. As on his last great expedition, he will receive the support of the Peary Arctic Club, but his work will also have the recognition of the American Government. It is announced, also, that Captain Bernier, whose plans for an expedition under the auspices of the Canadian Government have been previously alluded to in the *Journal*, has at last completed his arrangements, and will start for the north next year. Meanwhile, the Canadian Government steamer *Neptune* has sailed (in August of the present year) for Hudson bay and other Arctic waters, for the purpose of botanical, geological, and zoological research on behalf of the Canadian Government. Special attention will be devoted to the question of the cod and halibut fisheries, and with a view to their protection a police-station will be established at Chesterfield inlet. Formal possession will also be taken of the northern islands and the coasts of Baffin bay.

The Antarctic Relief Expeditions.—The work of refitting the *Terra Nova* for the voyage in relief of the *Discovery* was pushed forward with such energy that the ship was able to start from Portland on August 26. As far as Gibraltar she was towed by H.M.S. *Minerva*, and from Gibraltar to Aden by H.M.S. *Vindictive*, the latter port being reached on September 14. From Aden the ship proceeded direct to Hobart, where she will be joined by the *Morning*, it being hoped that the two ships may make the final start south by the beginning of December. The reasons for the selection of Hobart as the ultimate base are not quite apparent, as it involves not only the voyage of the *Morning* from Lyttleton to that port, but a greatly lengthened voyage for the two ships after their junction is effected. It should be mentioned that Captain Colbeck left this country some ten days before the departure of the *Terra Nova* in order to resume command of the *Morning*. The Swedish expedition for the relief of Dr. O. Nordenskiöld sailed from Stockholm, in the *Frithjof*, on August 17, under the command of Captain Gylden.

GEOGRAPHICAL LITERATURE OF THE MONTH.

Additions to the Library.

By **EDWARD HEAWOOD, M.A.,** *Librarian,* **R.G.S.**

The following abbreviations of nouns and the adjectives derived from them are employed to indicate the source of articles from other publications. Geographical names are in each case written in full:—

A. = Academy, Academie, Akademie.
Abh. = Abhandlungen.
Ann. = Annals, Annales, Annalen.
B. = Bulletin, Bollettino, Boletim.
Com. = Commerce.
C. Rd. = Comptes Rendus.
Erdk. = Erdkunde.
G. = Geography, Geographie, Geografia.
Ges. = Gesellschaft.
I. = Institute, Institution.
Iz. = Izvestiya.
J. = Journal.
k. u. k. = kaiserlich und königlich.
M. = Mitteilungen.
Mag. = Magazine.
Mem. = Memoirs, Mémoires.
Met. = Meteorological.
P. = Proceedings.
R. = Royal.
Rev. = Review, Revue.
S. = Society, Société, Selskab.
Sitzb. = Sitzungsbericht.
T. = Transactions.
V. = Verein.
Verh. = Verhandlungen.
W. = Wissenschaft, and compounds.
Z. = Zeitschrift.
Zap. = Zapiski.

On account of the ambiguity of the words *octavo, quarto,* etc., the size of books in the list below is denoted by the length and breadth of the cover in inches to the nearest half-inch. The size of the *Journal* is 10 × 6½.

A selection of the works in this list will be noticed elsewhere in the "Journal."

EUROPE.

Austria. *M.K.K.G. Ges. Wien* **46** (1903): 167-172. **Lorenz v. Liburnau.**

Nachträgliches über das Gmundener Schotterterrain. Von Dr. J. Ritter Lorenz v. Liburnau.

Austria. *M.K.K.G. Ges. Wien* **46** (1903): 173-189. ———

Bericht über die Leistungen des K. u. K. Militär-Geographischen Institutes im Jahre 1902.

Austria—Dalmatia. *B.S.G. Italiana* **4** (1903): 303-328. **Dainelli.**

Di alcuni rumori naturali che si odono presso Otres (Bribir) in Dalmazia. Nota del dott. G. Dainelli.

Austria—Istria. *Vierteljahrshefte G. Unterricht* **2** (1903): 235-238. **Krebs.**

Wanderungen aus Istrien. II. West- und Mittelistrien. Von Dr. N. Krebs.

Austria-Hungary. **Peucker.**

Kleines Orts-Lexikon von Österreich-Ungarn. Teil I.: Österreich nach der Zählung vom 31. Dezember, 1900. Mit Angabe der Meereshöhen. 3. Auflage. Neu zusammengestellt von Dr. K. Peucker. Wien: Artaria & Co., 1903. Size 6½ × 4½, pp. iv. and 60. *Price* 1 *kr. Presented by the Author.*

Denmark—Ice-age. **Ussing.**

Obersigt K. Danske Vidensk. Selsk. Forhandl. (1903): 99-165.

Om Jyllands Hedesletter og Teorierne for deres Dannelse. Af N. V. Ussing. Also *Résumé* in French. *With Maps.*

On the great terminal moraine of the old ice-sheet.

Denmark—Lake Sorö. **Wesenberg-Lund.**

Obersight K. Danske Vidensk. Selsk. Forhandl. (1903): 167-204.

Sur les Ægagropila Sauteri du lac de Sorö. Par C. Wesenberg-Lund. *With Map.*

Denmark—Marine Biology. *Mém. A.R. Sci. Danemark* **12** (1903): 221-326. ———

De danske Farvandes Plankton i Aarene 1898-1901. *With Maps and Illustrations.*

Finland—Åland. *Globus* **83** (1903): 359-364. **Schoener.**

Åland. Von J. G. Schoener. *With Illustrations.*

France. *La G., B.S.G. Paris* **7** (1903): 372-374. **Rabot.**

Tableau de la Géographie de la France. Par C. Rabot.

France—Bordeaux. *B.S.G. Com. Bordeaux* **29** (1903): 261-266. **Lasserre.**

Topographie ancienne et moderne de la ville de Bordeaux: son influence sur l'état sanitaire. Par Dr. G. Lasserre.

France—Canal. **Rivière.**
Canal du Nord. Conférence faite à la Société de Géographie de Lille le 27. Décembre 1902. Par M. La Rivière. (Supplément au Bulletin de la Société de Géographie de Lille de Février, 1903.) Lille, 1903. Size 10 × 6½, pp. 20. *Map.*

France—Corsica. *Vierteljahrs. Naturforsch. Ges. Zürich* 47 (1902): 243–384. **Rikli.**
Botanische Reisestudien auf einer Frühlingsfahrt durch Korsika. Von M. Rikli. *With Plates.*

See review, *ante*, p. 313.

France—Dordogne. *C. Rd.* 136 (1903): 1491-1493. **Martel.**
Sur la grotte de Font-de-Gaume (Dordogne) et l'âge du creusement des cavernes. Note de E. A. Martel.

France—Marne and Aisne. **Cooreman and Dollfus.**
Compte rendu des excursions de la session extraordinaire de la Société Belge de Géologie, etc., dans les départements français de la Marne et de l'Aisne (du 8 au 15 aout 1901) Par T. Cooreman et G. Dollfus. (Extrait du *Bulletin de la Soc. Belge de Géologie*, etc., Tome xvi., 1902.) Bruxelles, 1903. Size 10 × 6½, pp. 209–284. *Map and Illustrations.*

France—Orne, etc. *La G., B.S.G. Paris* 7 (1903): 427–442. **Paquier**
Distribution géographique des forces hydrauliques dans le département de l'Orne et les départements voisins. Par J. B Paquier. *With Maps.*

Germany—Agriculture. **Rose.**
Agricultural Instruction in Germany and the Development of German Agriculture and Agricultural Industries. Foreign Office, Miscellaneous, No. 594. 1903. Size 9½ × 6, pp. 74. *Price 4d.*

Germany—Brandenburg. *Globus* 84 (1903): 3-6. **Mielke.**
Die Ausbreitung des sächsischen Bauernhauses in der Mark Brandenburg. Von R. Mielke. *With Map and Plans.*

Germany—Coasts. *G.Z.* 9 (1903): 305-331. **Toepfer.**
Die deutsche Nordseeküste in alter und neuer Zeit. Von Dr. H. Toepfer.

Germany—Cologne and Rhine. ———
Festschrift zur Begrüssung des 14. Deutschen Geographentages. Beiträge zur Wirtschaftsgeographie und Wirtschaftsgeschichte der stadt Köln und des Rheinlandes. Koln, 1903. Size 9 × 6, pp. 186. *Map and Illustrations.*

Germany—Ethnology. *Deutsch. Rundschau G.* 25 (1903): 455–458. **Reiner.**
Die Sorben in Deutschland. Von Dr. J. Reiner. *With Illustrations.*

Germany—Prussia—Lakes. **Braun.**
Ostpreussens Seen. Geographische Studien . . . Von Gustav Braun. Königsberg i. Pr.: R. Leupold, 1903. Size 11½ × 9, pp. 94. *Maps. Presented by the Author.*

Germany—Rivers. *M.V. Erdk. Leipzig* (1902): 1–55. **Feldner.**
Die Flussdichte und ihre Bedingtheit im Elbsandsteingebirge und in dessen nordöstlichen Nachbargebieten. Von Dr. H. Feldner. *With Map.*

Germany—Saxony. *M.V. Erdk. Leipzig* (1902): 57–135. **Stübler.**
Anthropogeographische Studien in der Sächsischen Schweiz. Von J. Stübler. *With Maps and Illustrations.*

Germany—Saxony. *Z.K. Sächs. Statist. Bureaus* 48 (1902): 27–79. **Wächter.**
Die sächsischen Städte im 19. Jahrhundert. Von Dr. G. Wächter.

Germany—Saxony. *Z.K. Sächs. Statist. Bureaus* 48 (1902): 157-169. **Wächter.**
Die Bevölkerung Sachsens nach Geschlecht, Alter und Familienstand. Von Dr. G. Wächter.

Germany—Schleswig. *Sitzb. K.P.A.W. Berlin* (1903): 281–295. **Reinke.**
Die Entwickelungsgeschichte der Dünen an der Westküste von Schleswig. Von Prof. Dr. J. Reinke. *With Illustrations.*

Germany—Sunshine. *Petermanns M.* 49 (1903): 102–109. **Eichhorn.**
Entwurf einer Sonnenscheindauer-Karte für Deutschland. Von Dr. A. Eichhorn. *With Maps.*

Italy—Friuli. *B.S.G. Italiana* 4 (1903): 185–204. **Musoni.**
Tedeschi e Slavi in Friuli secondo l'ultimo censimento. Nota del Prof. F. Musoni. *With Maps.*

Italy—Sicily. **Ricchieri.**
Prof. Giuseppe Ricchieri. Quali insegnamenti si possono trarre dai disastri di Mòdica. (Estratto dalla Rivista *L'Università Popolare*—Mantova.) Mantua, 1903. Size 9 × 6½, pp. 18. *Presented by the Author.*

Italy—Solar Radiation. *Atti R.A. Lincei, Rendiconti* 12 (1903): 258–263. **Chistoni**
Misure pireliometriche eseguite a Sestolà ed al Monte Cimone nell' estate 1899. Nota di Ciro Chistoni.

Mediterranean—Cyprus. **Richards.**
The Cyprus Civil List, 1903. Compiled . . . by T. H. Hatton Richards. Nicosia, 1903. Size 10 × 6½, pp. 132 and lx. *Map. Presented by the Compiler.*

Meuse. *C. Rd.* 137 (1903): 85–88. **Bois.**
Sur les variations de la Meuse à l'époque quaternaire. Note de P. Bois.

Montenegro. *Deutsch. Rundschau G.* 25 (1903): 385–396. **Struck.**
Montenegro und sein Eisenbahnprojekt. Von Adolf Struck. *With Map and Illustrations.*

Norway—Elk. *P. Zoolog. S.* (1903) I.: 133–151. **Elwes.**
On the Present Condition and Habits of the Elk in Norway. By H. J. Elwes, F.R.S. *With Illustrations.*

Pyrenees. *C. Rd.* 136 (1903): 1347–1349. **Roussel.**
Sur les recouvrements survenus dans le partie surélevée des Pyrénées. Note de J. Roussel.

Pyrenees. *C. Rd.* 137 (1903): 148–149. **Roussel**
Sur l'origine des plis et des recouvrements dans les Pyrénées. Note de J. Roussel.

Rumania. **Lahovary, Jonescu, and Turnbull.**
The Jewish Question in Roumania, by Jean Lahovary. With an Introductory Letter by Také Jonescu. The whole translated by A. L. Turnbull. London: Raggett & Co. (N.D.). Size 8½ × 5½, pp. 48. *Price* 1*s.*

Russia. *G.Z.* 9 (1903): 266–284. **Tschulok.**
Das Seengebiet des nordwestlichen Russland. Von S. Tschulok.

Russia. *B.S.G. Com. Paris* 25 (1903): 109–119. **Baye.**
En Petite-Russie, Souvenirs d'une Mission. Par M. le baron de Baye.

Russia—Crimea. *Globus* 84 (1903): 7–11. **Meyer.**
Tschufut-Kaléh. Von A. Meyer. *With Illustrations.*

Russia—Historical. **Westberg.**
Mém. A. Imp. Sci. St. Pétersbourg 5, No. 2 (1901): pp. 126.
Die Fragmente des Toparcha Goticus (*Anonymus Tauricus*) aus dem 10. Jahrhundert. Von F. Westberg. *With Diagrams.*

These fragments include descriptions of a crossing of the Dnieper on the ice, and of a journey beyond it, and an account of measures taken to cope with inroads of barbarians.

Russia—Ural. *C. Rd.* 136 (1903): 1409–1411. **Duparc and Mrazec.**
Sur le minerai de fer de Troïtsk (Oural du Nord). Note de L. Duparc et L. Mrazec.

Sweden. **MacGregor.**
Trade of Stockholm and Eastern Coast of Sweden for the year 1902. Foreign Office, Annual No. 3014, 1903. Size 10 × 6, pp. 28. *Price* 2*d.*

Switzerland. **Baedeker.**
Switzerland and the adjacent portions of Italy, Savoy, and Tyrol. Handbook for travellers by Karl Baedeker. Twentieth Edition. Leipsic: K. Baedeker, 1903. Size 6½ × 4, pp. xxxviii. and 538. *Maps, Plans, and Panoramas. Price* 8*m. Presented by the Editor.*

Switzerland. *An. S. Ci. Argentina* 55 (1903): 145–160. **Giménez.**
La perforación del túnel del Simplón. Por J. Velásquez Giménez.

Turkey—Macedonia. *Globus* 83 (1903): 213–219, 238–243. **Struck.**
Die macedonischen Seen. Von Adolf Struck. *With Maps and Illustration.*

United Kingdom—Hertfordshire. **Fordham.**

Hertfordshire Maps: a Descriptive Catalogue of the Maps of the Country, 1579–1900. By H. G. Fordham. Second Part. (From the *Transactions of the Hertfordshire Natural History Society*, vol. xi. part 6, pp. 33-72.) Size 10½ × 7½. *Map. Presented by the Author.*

The first part appeared in Part i. of the same volume. The present instalment carries the survey down to 1789.

United Kingdom—Liverpool. *T. Liverpool G.S.* (1902): 21–68. **Nevins.**

Liverpool Past and Present: from Domesday Book to 1903. By Dr. J. Birkbeck Nevins. *With Illustrations.*

United Kingdom—London. **Ordish.**

Annual Record of the London Topographical Society, 1900, including the Reports of the first three Annual Meetings of the Society. Edited by T. F. Ordish. London: published by the Society, 1901. Size 9 × 6, pp. xii. and 114. *Illustrations.*

United Kingdom—Mersey. **Nares.**

Report on the Present State of the Navigation of the River Mersey (1902), to the Right Honourable the Commissioners for the Conservancy of the River Mersey. By Vice-Admiral Sir G. S. Nares. London: Darling & Son. Size 9½ × 6, pp. 22. *Presented by the Acting Conservator.*

United Kingdom—Rainfall. *Symons' Meteorolog. Mag.* **38** (1903): 93-99. ———

The Rainfall of June, 1903. *With Map.*

The map shows the remarkable distribution of the heavy rains in June, the wettest zone in England virtually coinciding with the valley of the Thames and Lea.

United Kingdom—South Wales. **Strahan, Tiddemann, and Gibson.**

248. Memoirs of the Geological Survey. England and Wales. The Geology of the South Wales Coalfield. Part iv. The country around Pontypridd and Maes-Tég, being an account of the region comprised in sheet 248 of the map. By Aubrey Strahan, R. H. Tiddeman, and Walcot Gibson. London, 1903. Size 9½ × 6, pp. vi. and 134. *Map and Illustrations. Price* 1*s.* 6*d. Presented by the Geological Survey.*

United Kingdom—Staffordshire. **Barrow.**

Memoirs of the Geological Survey. England and Wales. The Geology of the Cheadle Coal Field. By George Barrow. London, 1903. Size 9½ × 6, pp. 62. *Map and Diagrams. Price* 2*s. Presented by the Geological Survey.*

ASIA.

Asia. *Asien* **2** (1903): 110–112, 144–146. **Wirth.**

Epochen asiatischer Geschichte. Von Dr. A. Wirth.

China. *Tour du Monde* **8** (1902): 61–84; **9** (1903): 265-300. ———

Journal d'un Officier du Corps Expéditionnaire de Chine. *With Map and Illustrations.*

China—Kiau-chou. **Schrameier.**

Dr. Schrameier. Die Grundlagen der wirtschaftlichen Entwicklung in Kiautschou. Vortrag, gehalten in der Abteilung Berlin-Charlottenburg der Deutschen Kolonial-Gesellschaft am 13. Januar 1903. Berlin: D. Reimer, 1903. Size 9 × 6, pp. 26–60. *Presented by the Publisher.*

China—Kiau-chou. *G.Z.* **9** (1903): 185-192. **Wegener.**

Die Bedeutung der Kolonie Kiautschou. Von Dr. G. Wegener.

China—Railways. *Globus* **83** (1903): 383-384. **Kleist.**

Die Eisenbahnbauten in China. Von — von Kleist.

China—Szchuen. *Questions Dipl. et Colon.* **16** (1903): 123–138. ———

Aperçu sur les routes du Se-tchouen. Par un explorateur. *With Map.*

China—Yangtse. *La G., B.S.G. Paris* **7** (1903): 361–364. **d'Anty.**

L'œuvre géographique de la mission Hourst sur le haut Yang-tseu. Par P. Bons d'Anty.

See note, *ante*, p. 211.

Chinese Turkestan. *Sitzb. K.P.A.W. Berlin* (1903): 184-196. **Franke and Pischel.**

Kaschgar und die Kharosṭhī. Von O. Franke und R. Pischel.

Eastern Asia. **Hefele.**
M. Deutsch. Ges. Natur- u. Völkerk. Ostasiens 9 (1903): 169-272.
Aus dem Osten. Reisen in Sachalin, Ostsibirien, der Mandschurei, China und Korea. Von Dr. K. Hefele.

India—Assam. *J.S. Arts* 51 (1903): 612-636. **Lyall.**
The Province of Assam. By Sir C. J. Lyall, K.C.S.I.

India—Historical. *Indian Antiquary* 32 (1903): 1-15, 145-160. **Philipps.**
The Connection of St. Thomas the Apostle with India. By W. R. Philipps.

Japan. *Asien* 2 (1903): 137-142. **Kürchhoff.**
Handels- und Verkehrsverhältnisse in Japan. Von Oberleutnant a. D. Kürchhoff.

Japan—Forestry. **Hefele.**
M. Deutsch. Ges. Natur- u. Völkerk. Ostasiens 9 (1903): 147-168.
Forstliche Reiseeindrücke in Japan. Von Dr. K. Hefele.

Japan—Formosa. **Griffiths.**
Trade of South Formosa for the year 1902. Foreign Office, Annual No. 3000, 1903. Size 9½ × 6½, pp. 24. *Price* 1½*d*.

Japan—Formosa. *J.G., Tōkyō G.S.* 14 (1902): 448-457, 523-534. **Inoue.**
Geological Trip across the Watershed-Range of Taiwan (Formosa). By Kinosuke Inoue. [In Japanese.]

Korea. *J.G., Tōkyō G.S.* 14 (1902): 467-477. **Kotô.**
Topography of North Corea. By Bunjirō Kotô. [In Japanese.]

Korea. *J. College Sci. Imp. University Tōkyō* 19 (1903): 1-62. **Kotô.**
An Orographic Sketch of Korea. By B. Kotô. *With Map and Plates.*

Malay Archipelago—Celebes. *Globus* 83 (1903): 349-350. **Sarasin.**
Reise der Herren Dr. P. und F. Sarasin in der südöstlichen Halbinsel von Celebes. See note, *ante*, p. 458.

Malay Archipelago—Sumatra. **Collet.**
B.S. d'Etudes Colon. 9 (1902): 551-582, 617-652, 711-746; 10 (1903): 1-57, 81-144.
Le tabac à Sumatra. Par O. J. A. Collet. *With Illustrations.*

Malay Archipelago—Sumatra. ———
Bijd. Taal-, Land- en Volkenk. Ned.-Indië (7) 1 (1903): 363-401.
Mededeelingen betreffende de Atjehsche onderhoorigheden.

Malay Peninsula—Perak. ———
Supplement to the *Perak Government Gazette*, 26th June, 1903. Annual Reports, 1902. Size 13½ × 8½.

Pamirs. *Sitzb. K.A.W. Wien* 111 (Abt. Ia.) (1902): 276-295. **Stankewitsch.**
Magnetische Messungen, ausgeführt im Pamir im Sommer 1900. Von Prof. B. W. Stankewitsch.

Persia and Baluchistan. *T. Liverpool G.S.* (1902): 69-78. **Sykes.**
Southern Persia and Baluchistan. By Major P. Molesworth Sykes, C.M.G.

Philippine Islands—Mayon. *Sierra Club B.* 4 (1903): 228-234. **Venable.**
The Ascent of Volcano Mayon. By Andrew Venable.

The ascent was accomplished last year by Lieut. Barton and Mr. Bubar, the successful members of an American party which made the attempt (see *ante*, p. 457).

Russia—Caucasus. **Stevens.**
Tea Industry of the Caucasus. Foreign Office, Miscellaneous, No. 593. Size 10 × 6½, pp. 8. *Price* ½*d*.

Russia—Sakhalin. *Wide World Mag.* 10 (1903): 573-580. **Hawes.**
The Island of Murderers. By C. H. Hawes. *With Illustrations.*

Russia—Siberian Railway. **Shoemaker.**
The Great Siberian Railway from St. Petersburg to Pekin. By Michael Myers Shoemaker. New York and London: G. P. Putnam's Sons, 1903. Size 8 × 5½, pp. viii. and 244. *Map and Illustrations. Price* 9*s*.

Turkey—Armenia. **Huntington.**
Weitere Berichte über Forschungen in Armenien und Commagene. Von E.

Huntington. (Zeitschrift für Ethnologie, Jahrg. 1901. Pp. 173–209.) [Berlin.] Size 10 × 6½. *Illustrations.*

Turkey—Asia Minor. *Sitzb. K.A.W. Wien* 110 (Abt. I.) (1901): 388–402. **Schaffer.**

Neue geologische Studien im südöstlichen Kleinasien (ausgeführt auf einer Reise im Sommer 1901). Von Dr. F. Schaffer.

Turkey—Palestine. **Hanauer.**
Palestine Exploration Fund, Quarterly Statement (1903): 258–264.

The Traditional "Harbour of Solomon" and the Crusading Castle at Jaffa. By the Rev. J. E. Hanauer. *With Map.*

AFRICA.

Abyssinia. **Bieber.**

Aethiopiens Aussenhandel und der österreichische Export. Von F. J. Bieber. Wien, 1902. Size 9 × 6, pp. 16.

Abyssinia. **Bieber.**

Die wirtschaftliche Erschliessung Aethiopiens und der österreichische Export. Von F. J. Bieber. Wien, 1903. Size 9½ × 6½, pp. 34.

Abyssinia. *M.V. Erdk. Leipzig*, 1902 (1903): xxi.-xxv. **Erlanger.**

Forschungsreise in den Jahren 1900 und 1901 in Süd-Abessinien, den Somali- und Gallaländern. Von Freiherr Carlo von Erlanger.

Africa—Ethnology. *B.S.G. Italiana* 4 (1903): 361–374. **Mochi.**

La civiltà egiziana tra i selvaggi dell' Africa. Nota del dott. A. Mochi. *With Map and Illustration.*

On objects from the Congo State which represent an early Egyptian type.

Africa—Game. *J.S. Arts* 51 (1903): 566–578. **Buxton.**

The Preservation of Big Game in Africa. By E. N. Buxton.

Algeria. *Questions Dipl. et Colon.* 16 (1903): 139–145. **Franklin.**

Dans le Sud-Oranais. Par J. H. Franklin. *With Map.*

Algeria. *B.S.G. Lille* 39 (1903): 502–533. **Nicolle.**

Excursion en Algérie à l'occasion du Congrès d'Oran en 1902. Par E. Nicolle.

Algeria—Population. *Rev. Française* 28 (1903): 257–260. **Vasco.**

La population de l'Algérie. Par G. Vasco.

Algeria—Timgad. *Tour du Monde* 9 (1903): 313–324. ———

Une Ville entière exhumée du sable: Timgad. *With Illustrations.*

Algerian Sahara. *Ann. G.* 12 (1903): 235–259. **Gautier.**

Sahara oranais. Par É. F. Gautier. *With Map.*

See note in the Monthly Record (*ante*, p. 461).

Azores. *M.K.K.G. Ges. Wien* 46 (1903): 190–192. **Sieger.**

Wohin gehören die Azoren? Von Prof. Dr. R. Sieger.

Cape Colony. *T. South African Philosoph. S.* 14 (1903): 1–27. **Beattie and Morrison.**

The Magnetic Elements at the Cape of Good Hope from 1605 to 1900. By J. C. Beattie and J. T. Morrison.

Cape Colony. *T. South African Philosoph. S.* 14 (1903): 66–75. **Rogers and Schwarz.**

The Transkei Gap. By A. W. Rogers and E. H. L. Schwarz.

Cape Colony. *T. South African Philosoph. S.* 14 (1903): 98–112. **Schwarz.**

The Volcanoes of Griqualand East. By E. H. L. Schwarz.

Central Africa—Tanganyika. **Waechter.**
Beiträge Kolonialpolitik 4 (1902–1903): 456–462, 467–473.

Die Tanganyka-Dampfer-Expedition 1898–1901. Von Fr. Waechter.

Egypt. *B.S. Khédiv. G.* 5 S., *Supplément* (1903): 747–782. **Willcocks.**

L'Égypte dans cinquante ans. Par Sir W. Willcocks, C.M.G.

This paper, read on March 15, 1902, gives a forecast of the position in Egypt and the Sudan fifty years hence (cf. *ante*, p. 329).

Eritrea. *B.S.G. Italiana* 4 (1903): 375–400. **Marini.**

Colonia Eritrea: Escursione lungo le coste settentrionali della penisola di Buri e isole adiacenti. Nota del prof. A. Marini. *With Maps and Illustrations.*

French Congo. *B.S.G. Com. Paris* **25** (1903): 120–140. **Avon.**
Du Congo au Tchad. Par le Lieutenant C. Avon. *With Map.*
The author served under Colonel Destenave.

French Congo. *B.S.G. Com. Paris* **25** (1903): 205–221. **Chesnay.**
Le Pays de Makabana, dans le Haut-Niari, son sol, ses productions, ses peuplades (Congo Français). Par G. B. du Chesnay. *With Map.*

French Congo. *C. Rd.* **136** (1903): 1591–1593. **Lacoin.**
Sur la géologie du pays de l'Oubangui au Tchad. Note de M. Lacoin.

French Guinea. *B.S.G. Lille* **39** (1903): 481–489. **Van Cassel.**
La Haute-Guinée française, son avenir agricole. Par C. Van Cassel.

French Sudan. *La G., B.S.G. Paris* **7** (1903): 354–360. **Chevalier.**
Mission Scientifique au Chari et au Tchad. Par A. Chevalier. *With Map.*

French Sudan. *La G., B.S.G. Paris* **7** (1903): 421–426. **Destenave.**
Exploration des îles du Tchad. Par — Destenave. *With Map.*
See note in the Monthly Record for August (p. 212).

French Sudan. *C. Rd.* **136** (1903): 1297–1298. **Lapparent.**
Sur deux nouveaux fossiles du Soudan. Note de A. de Lapparent.
See note in August *Journal* (p. 211). The present note describes two other fossils found in Damerghu, one being the first ammonite brought from the Sudan.

French Sudan. *La G., B.S.G. Paris* **7** (1903): 417–420. **Lapparent.**
Sur une formation marine d'âge tertiaire au Soudan français. Par A. de Lapparent.
Noticed in the Monthly Record (*ante*, p. 211).

German East Africa. *Globus* **84** (1903): 29–31. **Förster.**
Zur Klimatologie Deutsch-Ostafrikas. Von B. Förster. *With Diagrams.*

German East Africa. *Beiträge Kolonialpolitik* 4 (1902–3): 35–48, 71–80. **Kandt.**
Von der Westküste unserer ostafrikanischen Kolonie. Von Dr. Richard Kandt.

German East Africa. *G.Z.* 9 (1903): 1–20, 80–90, 140–149, 213–228. **Maurer.**
Deutsch-Ostafrika. Eine Klimatologische Studie. Von Dr. H. Maurer.

German East Africa. **Beringe.**
Deutsch. Kolonialblatt 14 (1903): 234–235, 264–266, 296–298, 317–319.
Bericht des Hauptmanns v. Beringe über eine Expedition nach Ruanda.

German East Africa. *Deutsch. Rundschau G.* **25** (1903): 406–415. **Schnurpfeil.**
In den Steppengebieten Deutsch-Ost-Afrikas. Von Hans Schnurpfeil. *With Illustration.*

German South-West Africa. *Globus* **84** (1903): 27–29. **Gentz.**
Gie Geschichte des südwestafrikanischen Bastardvolkes. Von Leutnant Gentz. *With Map and Illustrations.*

German South-West Africa. *M.V. Erdk. Leipzig*, 1903 (1903): xiv.–xvii. **Hartmann.**
Forschungsreise im Kunenegebiet. Von Oberleutnant Dr. G. Hartmann.

German South-West Africa. **Dittmer.**
Beiträge Kolonialpolitik 4 (1902–1903): 308–310.
Reise des Forstreferendars Wiedeburg nach Südwestafrika. Von Kapitän D. R. Dittmer.

Ivory Coast and Liberia. *Ann. G.* **12** (1903): 260. **D'Ollone.**
Côte d'Ivoire et Libéria. Par le capitaine d'Ollone. *With Map.*

Kamerun. *Beiträge Kolonialpolitik* 4 (1902–1903): 302–307. **Rieder.**
Ist der Nyong schiffbar? Eine Studie von P. Rieder.

Lagos. *J.S. Arts* **51** (1903): 650–659. **Ewart.**
Lagos: its Hinterland, its Products, and its People. By Major J. H. Ewart.

Madagascar. *Rev. G.* **52** (1903): 516–521. **Claude.**
Diégo-Suarez, point d'appui de la flotte. Par — Claude. *With Map.*

Madagascar. ———
Les Voies de Communications à Madagascar. (Revue de Madagascar. Supplément illustré.) Paris. Size 10 × 6½, pp. 96. *Maps and Illustrations.*

Nigeria. **Lejeune.**
Miss. Catholiques 35 (1903): 88-91, 102-105, 114-117, 127-129, 140-142.
Dans la Bénué (Nigeria). Par le R. P. Lejeune. *With Map and Illustrations.*

Rhodesia—Zimbabwe. **Hall.**
South Africa 57 (1903): 550-553, 632-635, 712-715, 788-791.
Great Zimbabwe. The Hill or Acropolis Ruins. By R. N. Hall. *With Illustrations.*

Somaliland. ———
Africa. No. 3 (1902). Correspondence respecting the Rising of the Mullah Muhammed Abdullah in Somaliland and consequent Military Operations, 1901–1902. London: Eyre & Spottiswoode, 1902. Size 13½ × 8½, pp. iv. and 60. *Price* 6½*d.*

Togo. *Beiträge Kolonialpolitik* 4 (1902-1903): 311-328. **Fies.**
Besuch des Missionsinspektors A. W. Schreiber auf dem Arbeitsgebiet der Norddeutschen Mission in Togo. Von K. Fies. *With Illustrations.*

Transvaal—Gold-mining. ———
A Descriptive and Statistical Statement of the Gold-mining Industry of the Witwatersrand. Annexure to the Thirteenth Report of the Transvaal Chamber of Mines for the year 1902. Size 9½ × 7, pp. 42. *With Case of Diagrams.*

West Africa—Historical. *Deutsch. G. Blätter* 26 (1903): 1-21. **Henning.**
Der Handel an der Guineaküste im 17. Jahrhundert. Von Dr. G. Henning.

West Africa—Muni. *B.S.G. Com. Paris* 25 (1903): 141-148. **Roche.**
Le Rio-Muni. Par le capitaine J.-B. Roche.

NORTH AMERICA.

Alaska. **Collier.**
A Reconnaissance of the North-Western Portion of Seward Peninsula, Alaska. By A. J. Collier. (Dep. of the Interior, United States Geological Survey, Professional Paper No. 2.) Washington, 1902. Size 11½ × 9, pp. 70. *Maps and Illustrations. Presented by the U.S. Geological Survey.*

Canada—Tides and Currents. **Dawson.**
Survey of Tides and Currents in Canadian Waters. By W. Bell Dawson. Ottawa, 1903. Size 10 × 6½, pp. 28.

Gulf of St. Lawrence. *B. American G.S.* 35 (1903): 62-64. **Anderson.**
Improvements to Navigation in the Gulf of St. Lawrence. By Lieut.-Colonel W. P. Anderson.

Mexico. *B. American G.S.* 35 (1903): 79-93. **Lumholtz.**
The Huichol Indians of Mexico. By Carl Lumholtz.

United States. *Monthly Weather Rev.* 31 (1903): 173-175. **Mixer.**
River Floods and Melting Snow. By C. A. Mixer. *With Diagrams.*

United States—Boston. *J.G.* 2 (1903): 271-341. ———
The Geography of Boston. *With Maps and Illustrations.*
A very complete study of the geography of Boston under its various aspects.

United States—California. *Sierra Club B.* 4 (1903): 285-291. **Le Conte.**
Table of Elevations of Peaks in the Sierra Nevada Mountains over 12,000 feet above Sea-level. By J. N. Le Conte.

United States—California. *Sierra Club B.* 4 (1903): 253-263. **Le Conte.**
Among the Sources of the South Fork of King's River. By J. N. Le Conte. *With Plates.*

United States—California. **Leiberg.**
Forest Conditions in the Northern Sierra Nevada, California. By J. B. Leiberg. (Dep. of the Interior, United States Geological Survey. Professional Paper, No. 8.) Washington, 1902. Size 11½ × 9, pp. 194. *Maps. Presented by the U.S. Geological Survey.*

United States—Coast Range. *Sierra Club B.* 4 (1903): 264-273. **McAllister.**
The Coast Sierra from California to Panama. By M. Hall McAllister.

United States—Indiana. *American J. Sci.* 15 (1903): 459-468. **Kindle.**
The Niagara Domes of Northern Indiana. By E. M. Kindle. *With Illustrations.*

United States—Maryland. ——

Maryland Geological Survey. Cecil County. Baltimore, 1902. Size 10½ × 7, pp. 322. *Atlas (separate), Maps, and Illustrations.*

Ditto. Garrett County. Baltimore, 1902. Size 10½ × 7, pp. 340. *Atlas (separate), Maps, and Illustrations.*

United States—Minnesota. **Leith.**

The Mesabi Iron-bearing District of Minnesota. By Charles Kenneth Leith. (Department of the Interior. Monographs of the United States Geological Survey, vol. xliii.) Washington, 1903. Size 12 × 9, pp. 316. *Maps and Plates. Presented by the Department of the Interior.*

United States—Mississippi. **Brown.**

B. American G.S. **34** (1902): 371–383; **35** (1903): 8–16.

The Mississippi River from Cape Girardeau to the Head of the Passes. By R. M. Brown. *With Maps.*

United States—Morphology. *Vierteljahrshefte G. Unterricht* **2** (1903): 204–210. **Abbe.**

Die Fall-Linie der südöstlichen Vereinigten Staaten. Von Dr. Cleveland Abbe, jun.

On the line of maximum fall of the rivers of the region between the Blue Ridge and the Atlantic.

United States—New England. *La G., B.S.G. Paris* **7** (1903): 445–451. **Giraud.**

Terrasses fluviales de la Nouvelle-Angleterre. Par J. Giraud.

United States—New England. *American J. Sci.* **15** (1903): 437–446. **Hobbs.**

The Geological Structure of the South-Western New England Region. By W. H. Hobbs.

United States—Oregon. **Diller and Patton.**

The Geology and Petrography of Crater Lake, National Park. By J. S. Diller and H. B. Patton. (Dep. of the Interior, United States Geological Survey. Professional Paper, No. 3.) Washington, 1902. Size 11½ × 9, pp. 168. *Maps and Plates. Presented by the U.S. Geological Survey.*

United States—Oregon. **Gannett.**

The Forests of Oregon. By H. Gannett. (Dep. of the Interior, United States Geological Survey. Professional Paper, No. 4.) Washington, 1902. Size 11½ × 9, pp. 36. *Map and Plates. Presented by the U.S. Geological Survey.*

United States—Tennessee. *J. Geology* 11 (1903): 29–45. **Foerste.**

The Cincinnati Group in Western Tennessee, between the Tennessee River and the Central Basin. By A. F. Foerste. *With Map.*

United States—Utah and Arizona. **Davis.**

An Excursion to the Plateau Province of Utah and Arizona. By W. M. Davis. (*Bulletin* of the Museum of Comparative Zoology at Harvard College, vol. xlii. Geological Series, vol. vi. No. 1.) Cambridge, Mass., June, 1903. Size 9½ × 6, pp. 50. *Map and Plates.*

United States—Washington. **Dodwell and Rixon.**

Forest Conditions in the Olympic Forest Reserve, Washington, from Notes by A. Dodwell and T. F. Rixon. (Dep. of the Interior United States Geological Survey. Professional Paper, No. 7.) Washington, 1902. Size 11½ × 9, pp. 110. *Map and Plates. Presented by the U.S. Geological Survey.*

United States—Washington. **Gannett.**

The Forests of Washington, a Revision of Estimates. By H. Gannett. (Dep. of the Interior, United States Geological Survey. Professional Paper, No. 5.) Washington, 1902. Size 11½ × 9, pp. 38. *Map. Presented by the U.S. Geological Survey.*

United States—Washington. **Plummer.**

Forest Conditions in the Cascade Range, Washington, between the Washington and Mount Rainier Forest Reserves. By F. G. Plummer. (Dep. of the Interior, United States Geological Survey. Professional Paper, No. 6.) Washington, 1902. Size 11½ × 9, pp. 42. *Maps and Plates. Presented by the U.S. Geological Survey.*

CENTRAL AND SOUTH AMERICA.

Bolivia. *A travers le Monde, Tour du Monde* **9** (1903): 229–230. ——

La Crise du Caoutchouc et la nouvelle Route du Beni au Pacifique. *With Map.*

Bolivia and Brazil. ——

Bolivia-Brazil. Exposicion que la Sociedad Geográfica de La Paz dirige á las Sociedades Geográficas de Europa y América. La Paz, 1903. Size 8½ × 5½, pp. 150. *Maps.*

Brazil. *Beiträge Kolonialpolitik* 4 (1902-1903): 491-500. **Rauter.**

Die Mucury-Kolonien. Von Dr. A. Rauter.

Central America—Canal. *B. American G.S.* 35 (1903): 163-176. **Johnson.**

Comparison of Distances by the Isthmian Canal and other routes. By E. R. Johnson.

Central America—Canal. *B. American G.S.* 35 (1903): 24-43. **Morison.**

The Panama Canal. By G. S. Morison. *With Maps and Profiles.*

Central America and West Indies. *Z. Ges. Erdk. Berlin* (1903): 359-386. **Sapper.**

Die vulkanischen Ereignisse in Mittel-Amerika und auf den Antillen. Von Prof. Dr. K. Sapper. *With Illustrations.*

Chile and Argentina. *Petermanns M.* 49 (1903): 97-102. **Hauthal.**

Die Vulkangebiete in Chile und Argentinien. Von Prof. R. Hauthal. *With Map.*

Chile and Argentina. *M.V. Erdk. Leipzig* (1902): xxvii.-xxxiii. **Steffen.**

Das Chilenisch-Argentinische Grenzgebiet unter besonderer Berücksichtigung Patagoniens. Von Prof. Dr. H. Steffen.

Colombia—Panama. *Monthly Weather Rev.* 31 (1903): 117-125. **Abbot.**

Climatology of the Isthmus of Panama. By General H. L. Abbot. *With Diagrams.*

Mean Barometric Pressure at Sea-level on the American Isthmus. By the same.

Martinique. *C. Rd.* 136 (1903): 1343-1345. **Giraud.**

Sur l'état actuel du volcan de la montagne Pelée. Note de M. Giraud.

Martinique. *B.S.G. Rochefort* 25 (1903): 49-57. **Biteau.**

A propos de l'éruption du volcan du Mont-Pelé à la Martinique. Par M. Biteau.

Paraguay. *B.S.G. Italiana* 4 (1903): 218-252. **Cancio.**

Alla ricerca di Guido Boggiani nel Chaco boreale paraguayo. Relazione di J. F. Cancio.

Patagonia. *An. Museo Nac. Buenos Aires* 1 (1902): 321-327. **Ameghino.**

Sur la Géologie de Patagonie. Par F. Ameghino.

Peru—Mining. ——

Ministerio de Fomento. Boletin del Cuerpo de Ingenieros de Minas del Peru. No. 1. Documentos Oficiales. Lima, 1902. Size 9 × 6, pp. 47. *Diagram.*

Mainly occupied with the recent organization, etc., of the corps.

Porto Rico—Culebra Island. *B. American G.S.* 35 (1903): 125-130. **Haeselbarth.**

Culebra Island. By A. C. Haeselbarth. *With Map.*

AUSTRALASIA AND PACIFIC ISLANDS.

German Colonies. *Globus* 84 (1903): 21-25. **Fitzner.**

Die Bevölkerung der deutschen Südsee-Kolonien. Von Dr. R. Fitzner.

Laysan. *Popular Sci. Monthly* 63 (1903): 321-332. **Nutting.**

The Bird Rookeries on the Island of Laysan. By Professor C. C. Nutting. *With Illustrations.*

Laysan lies about 800 miles west by north of Honolulu.

Marianne Islands. **Schroeder.**

Beiträge Kolonialpolitik 4 (1902-1903): 147-153, 176-184, 199-208.

Auf der Reise nach Saypan (Mariannen), Tagebuchblätter. Von H. Schroeder.

New Guinea—German. *Ann. Hydrographie* 31 (1903): 303-306. **Seiferling.**

Segelanweisung und Beschreibung der Westküste der Gazelle-Halbinsel von Kap Kaponosárere bis zum Ausgang der Hixon-Bai, Bericht S. M. S. "Möwe." Komdt. Kaptlt. Seiferling.

New Zealand. *G.Z.* 9 (1903): 241-243. **Lendenfeld.**

Der landschaftliche Charakter Neuseelands. Von R. von Lendenfeld. *With Plates.*

New Zealand. ——

1902. New Zealand. Results of a Census of the Colony of New Zealand taken for the night of the 31st March, 1901. Compiled in the Office of the Registrar-General. Wellington: J. Mackay. 1902. Size 13 × 8, pp. xi., 396, and lxx.

Queensland. **Cameron**

Report on the Kangaroo Hills Mineral Field. By W. E. Cameron. Brisbane, 1901. Size 13½ × 8½, pp. 12. ***Map, Plans, and Sections.***

Queensland. **Jackson.**

Queensland. Department of Mines. Geological Survey Report, No. 177. The Opal-Mining Industry and the Distribution of Opal Deposits in Queensland. By C. F. V. Jackson. Brisbane: G. A. Vaughan, 1902. Size 10 × 6, pp. 34. ***Maps and Illustrations.***

Queensland. *Queensland Mining J.* 4 (1903): 174–177. **Jackson.**

Mount Hector. Preliminary Report on the Recent Discovery of Gold and Copper Ores. By C. F. V. Jackson. ***With Plan.***

Queensland. **Jackson.**

Queensland, Department of Mines. Geological Survey Report No. 180. Report on a Visit to the West Coast of the Cape York Peninsula and some islands of the Gulf of Carpentaria, also Reports on the Horn Island and Possession Island Gold Fields, and the recent prospecting of the Cretaceous Coals of the Cook District. By C. F. V. Jackson. Brisbane: G. A. Vaughan, 1902. Size 10 × 6, pp. 28. ***Maps and Illustrations.*** [See note, *ante*, p. 463.]

Queensland. **Cameron.**

Additions to the Geology of the Mackay and Bowen Districts. By Walter E. Cameron. (Queensland, Department of Mines, Geological Survey Report, No. 181.) Brisbane, 1903. Size 10 × 6½, pp. 22. ***Map and Plan.***

Queensland. **Cameron.**

Recent Mining Developments on the Ravenswood Gold Fields. By Walter E. Cameron. (Queensland, Department of Mines, Geological Survey Report, No. 183.) Brisbane, 1903. Size 10 × 6½, pp. 12. ***Map and Plan.***

Tuamotu Islands. *Rev. Colon.* (1903): 497–500. **Précaire.**

Rapport sur le cyclone des îles Tuamotou. Par A. de Précaire.

Western Australia. ——

Western Australia, Department of Lands and Surveys. Report by the Under Secretary for Lands for the year 1901. Perth, 1902. Size 13½ × 8½, pp. 46. *Map.*

POLAR REGIONS.

Antarctic. *Science* 18 (1903): 55–56. **Balch.**

Antarctica. By E. S. Balch.

A reply to Dr. Mill's review of the writer's book (*Journal*, vol. xxi. p. 525).

Antarctic—German Expedition. **Drygalski.**

Allgemeiner Bericht über den Verlauf der Deutschen Südpolar-Expedition, von Erich v. Drygalski. Mit Vorbemerkungen von Ferdinand Freiherr v. Richthofen und einem Anhang: Bericht über die Arbeiten der Kerguelen-Station von Karl Luyken. Berlin: E. S. Mittler und Sohn, 1903. Size 10½ × 7, pp. viii. and 54. ***Presented by the Publishers.***

Antarctic—German Expedition. *Ann. Hydrographie* 31 (1903): 293–295. **Krümmel.**

Weitere Ergebnisse der deutschen Südpolar-Expedition. Von Prof. Dr. O. Krümmel.

Review of Part 2 of the official report.

Arctic. *Tour du Monde* 9 (1903): 229–264. **Cagni.**

A pied et en traineau vers le Pole Nord. Par le Commandant Umberto Cagni. Traduit et résumé par H. Prior. ***With Map and Illustrations.***

Arctic—North-West Passage. *B. American G.S.* 35 (1903): 143–147. **Stone.**

On the North-West Passage and the Circumnavigation of America. By A. J. Stone.

Arctic—Norwegian Expedition. *Scottish G. Mag.* **19** (1903): 337–353. **Sverdrup.**
The Second Norwegian Polar Expedition in the *Fram*, 1898–1902. By Captain Otto Sverdrup. *With Maps.*

Spitsbergen. *Rev. gén. Sci.* **13** (1902): 1117–1130, 1165–1176. **Hansky.**
Les Travaux de l'Expédition russo-suédoise pour la mesure d'un arc de méridien au Spitzberg. Par A. Hansky. *With Map and Illustrations.*

MATHEMATICAL GEOGRAPHY.

Geodesy—Bibliography. **Gore.**
Treasury Department, U.S. Coast and Geodetic Survey. Geodesy. A Bibliography of Geodesy. Second Edition. By J. H. Gore. Appendix No. 8.—Report for 1902. Washington, 1903. Size 11½ × 9, pp. 427–787. *Presented by the U.S. Coast and Geodetic Survey.*

Navigation. *Rev. Maritime* **157** (1903): 1124–1136. **Decante.**
Détermination de la position du navire quand l'horizon n'est pas visible. Par E. Decante.

Practical Astronomy. *Ann. Hydrographie* **31** (1903): 244–247. **Fulst.**
Zur Höhenberechnung. Von Dr. O. Fulst.

Practical Astronomy. *Ann. Hydrographie* **31** (1903): 248–251. **Wedemeyer.**
Zur Höhenberechnung. Von A. Wedemeyer.

Surveying. *C. Rd.* **137** (1903): 24–30. **Laussedat.**
Sur un moyen rapide d'obtenir le plan d'un terrain en pays de plaines, d'après une vue photographique prise en ballon. Note de M. Laussedat.

Surveying—Methods. *T. South African Philosoph. S.* **14** (1903): 28–35. **Fourcade.**
On a Stereoscopic Method of Photographic Surveying. By H. G. Fourcade.

PHYSICAL AND BIOLOGICAL GEOGRAPHY.

Acoustics. *Quarterly J.R. Meteorolog. S.* **29** (1903): 145–150. **Boys.**
The Passage of Sound through the Atmosphere. By C. V. Boys, F.R.S.

Coral Islands—Limestones. **Skeats.**
The Chemical Composition of Limestones from Upraised Coral Islands, with notes on their Microscopical Structures. By E. W. Skeats. (Bull. Museum Comparative Zoology, Harvard College. Vol. xlii. (Geological Series, vol. vi. No. 2.) Cambridge, Mass., 1903. Size 10 × 6½, pp. 53–126. *Illustrations.*

Glacial Epoch. **Longe.**
Supplement to 'The Fiction of the Ice Age or Glacial Period.' By Francis D. Longe. Lowestoft: McGregor & Frazer, 1903. Size 8½ × 5½, pp. 36. *Price 1s. net. Presented by the Author.*

Ice-action. *P. and T. Nova Scotian I. Sci.* **10** (1901–1902): 455–457. **Prest.**
Supplementary Notes on Drift-Ice as a Transporting Agent. By W. H. Prest.

Limnology. **Müllner.**
Einige Erfahrungen und Wünsche auf dem Gebiete der Seenforschung. Von Dr. J. Müllner. Wien, 1903. Size 10 × 6½, pp. 32. *Presented by the Author.*

Meteorology. *C. Rd.* **136** (1903): 1186–1189. **Angot.**
Sur la valeur des moyennes en Météorologie et sur la variabilité des températures en France. Note de A. Angot.

Meteorology. *Sitzb. K.A.W. Wien* **111** (Abt. IIa.) (1902): 67–186. **Hann.**
Die Schwankungen der Niederschlagsmengen in grösseren Zeiträumen. Von J. Hann.

Meteorology. *C. Rd.* **136** (1903): 1245–1246. **Angot.**
Sur les variations simultanées des taches solaires et des températures terrestres. Note de A. Angot.

Meteorology. *Sitzb. K.P.A.W. Berlin* (1903): 298–306. **Assmann.**
Beobachtungen am Aëronautischen Observatorium über Temperatur-Umkehrungen. Von Prof. Dr. R. Assmann.

Meteorology. *Meteorolog. Z.* **20** (1903): 241-247. **Billwiller.**
Ueber den Vorschlag Wilds zur Einschränkung des Begriffs "Föhn." Von R. Billwiller.

Meteorology. *Meteorolog. Z.* **20** (1903): 247-255. ——
Bericht über die internationale Experten-Konferenz für Wetterschiessen in Graz.

Meteorology—Dust-fall. *C. Rd.* **136** (1903): 1713-1714. **Meunier.**
Pluie de poussière récemment observée en Islande. Note de S. Meunier.

Mountain Chains. *Geolog. Mag.* **10** (1903): 305-306. **Lake.**
The Circular Form of Mountain Chains. By P. Lake.

Oceanography. *C. Rd.* **137** (1903): 97-98. **Thoulet.**
Étude de la circulation marine. Note de J. Thoulet.

Oceanography—Atlantic. *Ann. Hydrographie* **31** (1903): 281-293. ——
Versetzungen auf den vereinbarten Dampferwegen zwischen dem Englischen Kanal und der Ostküste Nordamerikas. *With Diagrams.*
On deviations from course.

Oceanography—Nomenclature. *La G., B.S.G. Paris* **7** (1903): 443-444. **Sauerwein.**
Réunion de la Commission de nomenclature sub-océanique à Wiesbaden. Par C. Sauerwein.

Physical Geography. *G.Z.* **9** (1903): 21-40, 121-139, 193-213. **Hettner.**
Grundbegriffe und Grundsätze der physischen Geographie. Von Prof. Dr. A. Hettner.

Physical Geography. **Davis.**
Practical Exercises in Physical Geography by Prof. W. M. Davis. (Reprinted from the *Proceedings* Fifth Annual Conference, New York State Science Teachers' Association, held at the University of Rochester, December 28-29, 1900.) Size 9 × 6, pp. 12.

Sand. **Girard.**
L'évolution comparée des Sables. L'Érosion.—L'Abrasion météorique.—Les Dunes.—La transformation des Rivages. Par Jules Girard. Paris: F. R. de Rudeval, 1903. Size 11½ × 7½, pp. 124. *Maps and Illustrations. Price* 5 *fr.*

Seismology. *C. Rd.* **136** (1903): 1707-1709. **Ballore.**
Sur l'existence de deux grands cercles d'instabilité sismique maxima. Note de M. de Montessus de Ballore.

Zoogeography. *P. Zoolog. S.* (1903) I.: 109-110. **Stewart.**
On the Original Home of the Tiger. By Colonel C. E. Stewart, C.B.

Zoogeography—Sand-viper. *P. Zoolog. S.* (1903) I.: 185-186. **Boulenger.**
On the Geographical Variations of the Sand-viper, *Vipera ammodytes.* By G. A. Boulenger, F.R.S. *With Illustrations.*

ANTHROPOGEOGRAPHY AND HISTORICAL GEOGRAPHY.

Communications—Wireless Telegraphy. *Rev. Colon.* (1903): 501-542. **Magne.**
Notes sur des expériences faites au Congo français et sur une installation de postes aux Antilles. Par M. Magne. *With Map and Illustrations.*

Historical—Henry the Navigator. *B.S.G. Lisboa* **21** (1903): 33-51. **Mees.**
Henri le Navigateur et l'Académie Portugaise de Sagres. Pelo dr. J. Mees.

Historical—Survey. *B.S.G. Italiana* **4** (1903): 328-344. **Bellucci.**
L'Antico rilievo topografico del territorio perugino misurato e disegnato dal p. Ignazio Danti. Nota del Prof. A. Bellucci. *With Map.*
See note in the Monthly Record (*ante*, p. 456).

Industries. *Ann. G.* **12** (1903): 193-206. **Hauser.**
La localisation des industries, particulièrement aux États-Unis. Par H. Hauser.

Telegraphs. *Quarterly Rev.* **197** (1903): 364-383. ——
Imperial Telegraphs. *With Map.*

BIOGRAPHY.

Bellot. *B.S.G. Lyon* 18 (1903): 157–163. **Breittmayer.**
Un Explorateur Polaire Français, Lucien Bellot. Par A. Breittmayer.

Commerson. **Moewes.**
Naturw. Wochenschrift 2 (1903): 340–342, 349–355, 389–392, 400–403.
Philibert Commerson, der Naturforscher der Expedition Bougainvilles. Von Dr. F. Moewes.

Scherzer. *M.K.K.G. Ges. Wien* 46 (1903): 161–166. **Krupitz.**
Dr. Karl Ritter von Scherzer. Von Karl Krupitz.

GENERAL.

Bibliography. **Knox.**
Geographical Index (Extra-European) to Books, Periodicals, etc. Compiled in the Intelligence Division, War Office, by Alexander Knox, B.A., Map Curator, 1902. London: Printed by Harrison & Sons. Size 10½ × 7½, pp. xiv. and 82.

Bibliography. ——
Geological Literature added to the Geological Society's Library during the Year ended December 31st, 1902. [Issued May 30, 1903.] London, 1903. Size 9 × 5½, pp. 200. *Price* 2*s*. *Presented by the Geological Society.*

Congress. *B.S.G. Italiana* 4 (1903): 349–361. **Almagià and Guastalla.**
La Geografia nel Congresso Internazionale di Scienze Storiche. Nota del R. Almagià e C. W. Guastalla.

Mountaineering. *Appalachia* 10 (1903): 166–172. **Larrabee.**
Observations on the Physiology and Hygiene of Climbing. By R. C. Larrabee.

Place-names. ——
[Japanese Trans-literation of Place-names.] Size 9 × 6, pp. 46.

Telegraphy. **Johnson.**
The All Red Line. The Annals and Aims of the Pacific Cable Project. Edited by George Johnson. London: E. Stanford; Ottawa: J. Hope & Sons, 1903. Size 7½ × 5, pp. 486. *Map. Price* 6*s*. *Presented by Mr. Edward Stanford.*

Although in parts written in somewhat high-flown language, this work is useful as an attempt "to present the annals of the Pacific cable project in a concise and consecutive form." Various writers have contributed chapters on special parts of the story.

Year-Book. **Wagner.**
Geographisches Jahrbuch. XXV. Band, 1902. . . . herausgegeben von H. Wagner. Gotha: Justus Perthes, 1903. Size 9 × 6, pp. viii. and 488. *Price* 15*m*.

In addition to bibliographical reports on the regional geography of extra-European lands, this volume deals with recent publications on structural geology, geophysics, and surveying.

NEW MAPS.

By E. A. REEVES, *Map Curator*, R.G.S.

EUROPE.

Balkan Peninsula. **Steinhauser and Peucker.**
A Steinhauser's Karte von Südost-Europa. Scale 1 : 2,000,000 or 31·5 stat. miles to an inch. Die Staaten der Balkan-Halbinsel sammt Theilen von Oesterreich-Ungarn bis Budapest und Wien und den übrigen angrenzenden Ländern. Mit neuester politischer Eintheilung und statistischen Angaben von Dr. K. Peucker.

Uebersichtskarte der Balkanstaaten. Scale 1 : 3,000,000 or 47·3 stat. miles to an inch. Aus Scheda-Steinhausers Handatlas. Revidiert von Dr. Karl Peucker. Vienna: Artaria & Co., 1903. *Presented by the Publishers.*

Two small general maps of the Balkan Peninsula and portions of adjacent countries, revised by Dr. Karl Peucker, of Vienna. The one on the larger scale (1 : 2,000,000) is a new edition of A. Steinhauser's map, and the smaller (1 : 3,000,000) is from Scheda-Steinhauser's Handatlas. Statistical information is given in connection with areas, population, etc. The maps are printed in colours, and, although roughly produced, will be useful for general reference in connection with the present interest in this part of Europe.

England and Wales. **Ordnance Survey.**

ORDNANCE SURVEY OF ENGLAND AND WALES:—Sheets published by the Director-General of the Ordnance Survey, Southampton, from August 1 to 31, 1903.

1 inch :—

Printed in colours, 117, 133, 134 and part 118 (combined), 103, 104 (combined), 1*s.* 6*d.* *each ;* 75, 79, 1*s.* *each.*
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(*J. D. Potter, Agent.*)

PHOTOGRAPHS.

Persia. **Rigby.**

Fifty-three photographs of Persia, taken by Captain G. C. Rigby, 1st Wilts. Regiment, in 1903. *Presented by Captain G. C. Rigby.*

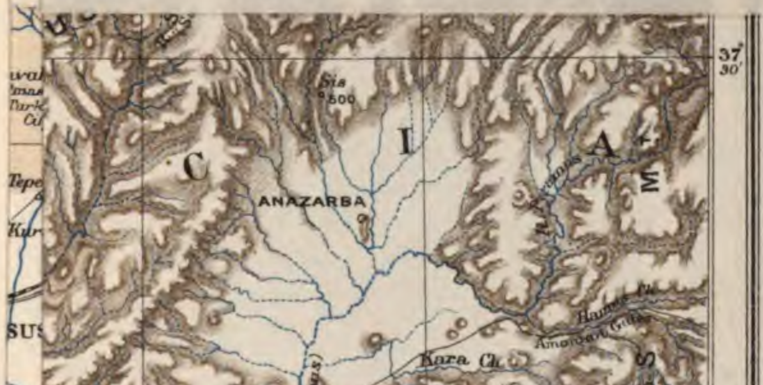
Many of these photographs are extremely interesting, especially those of Persepolis, and other ruins and antiquities, although from a purely geographical point of view those representing scenery, typical villages, etc., are, perhaps, more important.

(1) Panorama of Persepolis; (2) Looking down valley from Paichenar; (3) Ruin at Passargadae; (4) Bridge over Araxes; (5 and 40) Tomb of Cyrus; (6) Tomb of Hafiz, Shiraz; (7) The gap through which route from the north approaches Shiraz; (8) Market, Isfahan; (9 and 16) Lower bridge, Isfahan; (10) Tomb of Saadi, Shiraz; (11) Caravanserai, Manzaria; (12) Caravanserai, Mader-i-shah, built by the mother of Shah Abbas; (13) Madresseh-i-shah, Isfahan (exterior); (14) Madresseh-i-shah (interior); (15) Old palace, Isfahan, Ali Kapi, sacred gate; (17) Madresseh-i-shah, gate from inside; (18) Bridge, Isfahan; (19) Mosque, Isfahan; (20) Audience hall in palace, Isfahan; (21 and 26) Yezdikhast; (22) Old robber stronghold built on isolated rock, Yezdikhast; (23) Village of Maksud Beggi; (24 and 25) Maskat harbour; (27) Corner of Serai; (28 and 36) Kotal-i-Maller; (29) The last Kotal; (30) Fakir Abadeh; (31) Cliffs from south side of Dokhter pass; (32) On Pir-i-zan pass; (33) Bridge over Shapur river; (34) The end of Shiraz-Bushire route; (36) Wayside tea-shop, Pasangun; (37) Tarantas on top of Eburz range; (38) Corner of courtyard, Madresseh-i-shah, Isfahan; (39) Tomb of Darius; (41) Persian family, Puzeh; (42) Bund of Ali Verdi Khan, Khurud pass; (30) Garden at Shiraz; (44) Cliffs with names of ships, Maskat; (45) A Persian omnibus; (46) Persepolis; (47) On Khurud pass; (48) Bas-relief, Persepolis; (49) Gate of Kasvin; (50) Beggars at tomb of Saadi, Shiraz; (51) Grand staircase, Persepolis; (52) Bas-relief, Shahpur and suppliant emperor Valerian; (53) Tombs of kings, Puzeh.

N.B.—It would greatly add to the value of the collection of Photographs which has been established in the Map Room, if all the Fellows of the Society who have taken photographs during their travels, would forward copies of them to the Map Curator, by whom they will be acknowledged. Should the donor have purchased the photographs, it will be useful for reference if the name of the photographer and his address are given.

CILICIA, TARSUS,
AND THE GREAT TAURUS PASS.

RAMSAY.



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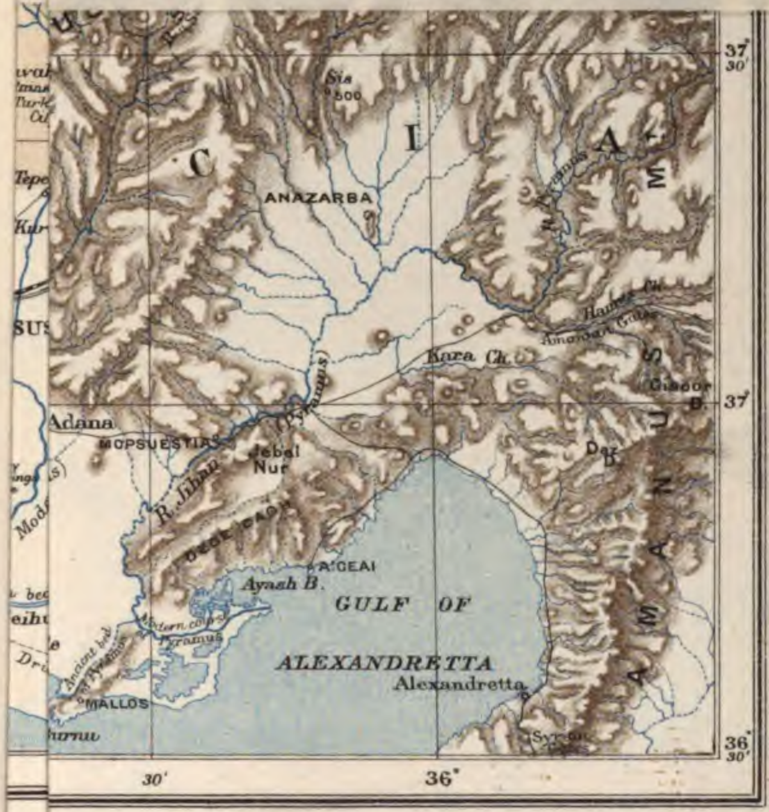

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The

Geographical Journal.

No. 5. NOVEMBER, 1903. Vol. XXII.

JOURNEYS IN MONGOLIA.*

By C. W. CAMPBELL, C.M.G.

Mongolia has not received much attention from Englishmen. Nor do I wonder. It has little or no charm for the tourist; no scenery, no sport. Mongol life is simple and not beautiful, and the few objects of interest are archæological relics, unattractive in form, and not easily accessible. For two centuries before the era of treaty relations with China, a sparse succession of Russian missions—ecclesiastical, commercial, and diplomatic—crossed the Gobi by one or other of the caravan routes from Kiakhta to Kalgan, and during the last forty years there has been a continuous if slender trickle of foreign travellers, mostly Russian, over the same routes; but they are the only tracks which can be considered beaten by Europeans. Elsewhere the important trade routes have been traversed by a number of Russian explorers and pioneers of commerce, but there is still a good deal of blank space on the map —blank space which hardly contains any secrets of moment.

If you set aside the regular caravan routes, and the south-eastern border from Dolon Nor to Kwei-hua-cheng (the "Blue Town" of Huc), few English names appear in the list of Mongolian travellers, and few of those turned their attention to regions west of the Kiakhta-Kalgan line. The most notable English name is Ney Elias, and his route was from Kwei-hua-cheng to Sair-usu, Uliasutai, Kobdo, and the Russian frontier at Biisk. There is no record of an English traveller in the large space from the Kiakhta routes on the west to the Khingan mountains on the east. Besides the Jesuit father Gerbillon, whose journeys date back two centuries, and Dr. Franke, of the German

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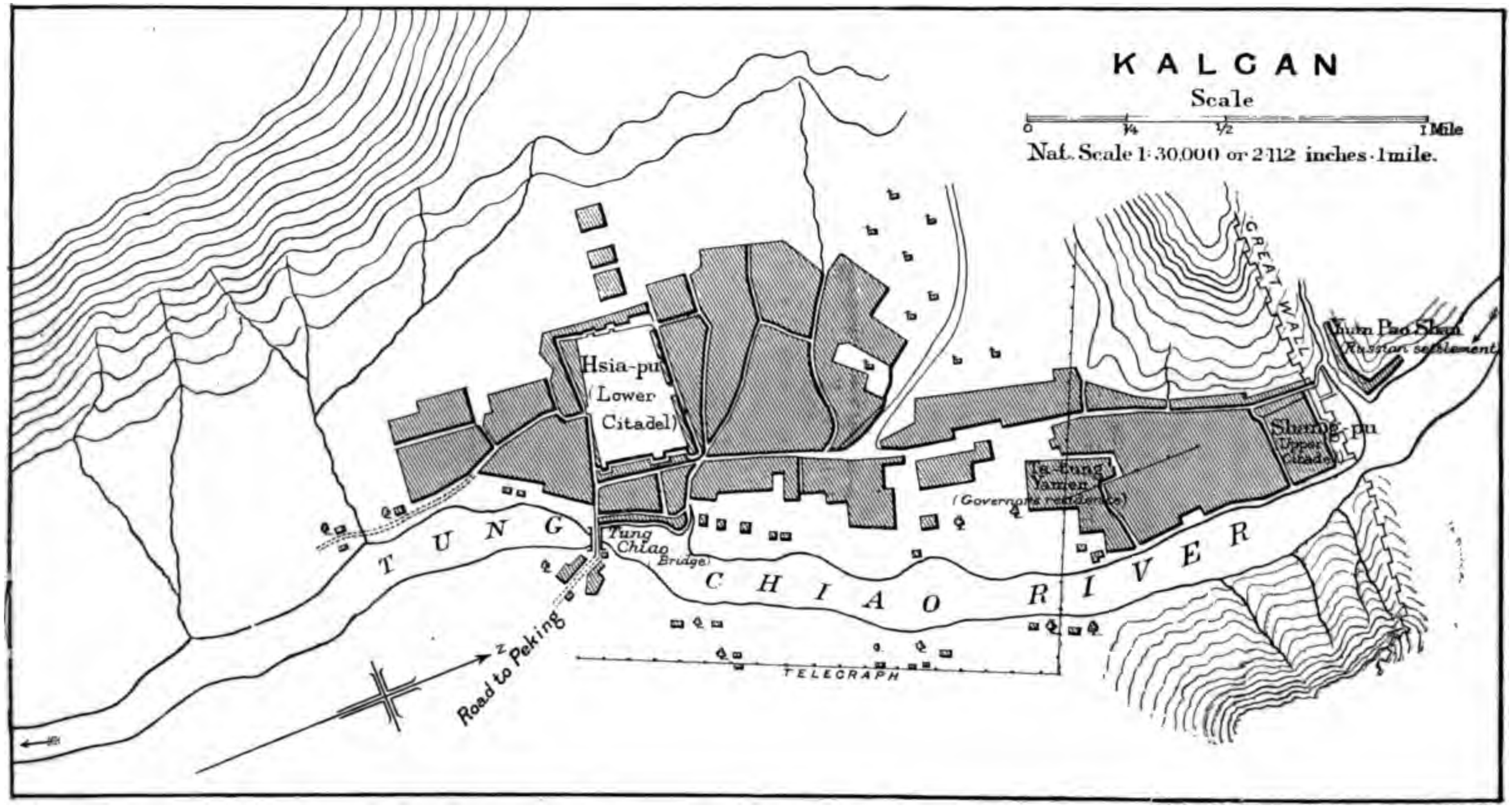
* Read at the Royal Geographical Society, June 8, 1903. Map, p. 600.

Consular Service, I know of none but Russians who have travelled in this space, and the number is small. The prominent names are Fritsche, Pozdnyéev, and Prjevalski, and the last went no further north than the Dalai Nor of Inner Mongolia. I was attracted to this region by a recommendation of Bretschneider, and in May, 1900, I found myself with sufficient time at my disposal to undertake a leisurely journey in East Mongolia. The outfit for this had been carefully arranged, and was the outcome of a year's preparation, but on my way north through Tientsin to Peking I was unfortunate or fortunate enough to drop into the middle of the Boxer outbreak, and I was forced by unlooked-for contingencies to postpone the expedition till the summer of 1902.

I may say here that I have journeyed on several occasions beyond the Great Wall in the region north of Peking; in 1893 a month's tour took me through Ku-pei-ku (Old North Pass) to Feng-ning Hsien and Jehol, the Simla of Kanghsi, who was the *roi soleil* of the Manchu dynasty; and in 1899 I spent a month in the Chahar country close by Kalgan. The starting-point of these excursions and of my journey of last year was always Peking, and as a preliminary step I cannot do better than commence at once on the shores of the great lake-sea of North China, the Gulf of Pechili, and direct attention shortly to the principal features of the terrestrial relief. There is the vast alluvial plain of Chi-li, larger than England, which stretches from the valley of the Yellow river northward, and is brought to an abrupt and striking termination by lines of mountains easily visible from Peking. On the sea-coast these mountains first attract notice near Shan-hai-kuan, well known as the east extremity of the Great Wall. Following them westward, they are seen to bend slightly south and again north until the valley of the Pei Ho is reached; here the plain, slightly rising—at Peking it is, according to Fritsche, 37·5 metres, or 120 feet, above sea-level—makes a deep irregular inroad on the domain of the hills, and it is here that we naturally look for the principal highways from lowland to plateau. Past Peking the mountains continue south-west and south, trimming the plain in the same bold fashion, but they do not there concern us. North-westward, the direction in which we are going, we file through them, and discover that they practically cease near Kalgan and Dolon Nor; beyond these points to north and west stretches a vast expanse where, amid much unevenness, no startling eminence is to be seen.

The contrast between the two regions thus separated by 100 miles or so of highlands is immense. The Chi-li plain, sown broad-cast with towns and villages, and so thickly that you are rarely a mile away from one, is as flat as a floor, and averages something very little above the surface of the sea; it is a great cornfield, and the swarming population lives on the products. The steppes and downs of Mongolia are 4000 feet above the sea-level at Dolon Nor, and at Angul Nor they are invariably undulating or spaced by low hills; there are hardly as many


KALGAN
Scale
0
¼
½
1 Mile
Nat. Scale 1:30,000 or 2·112 inches·1 mile.
GREAT WALL
Yuan Pao Shan
(Russian settlement)
Shang-pu
(Upper Citadel)
Ta-tung Yamen
(Governor's residence)
Hsia-pu
(Lower Citadel)
Tung Chiao
(Bridge)
TUNG CHIAO RIVER
TELEGRAPH
N
Road to Peking

souls as villages in Chi-li to the square mile; and cultivation, except on the south border and on a limited portion of the Siberian frontier, is unknown. The intervening zone of mountains is seen to be a long incline, the frayed and crumpled rim of the Mongol upland. It has been only partially surveyed, though sufficiently reconnoitred to establish that the trend of the higher chains—Richthofen enumerates four in the part west of Peking—is nearly north-east and south-west, and that few of the peaks exceed the verge of the plateau in absolute height.

Peking lies in the extreme north of the Chi-li plain, within a score of miles of the south edge of these mountains. The new railway ends there, and in point of time it is still, in 1903, as far from territory inhabited by Mongols as London is from Moscow, yet it is much the most convenient and appropriate base for an expedition into Mongolia. A glance at the map shows the convenience; it is placed on the line of least natural obstruction, and the trade routes of Mongolia converge on it. And what more appropriate as a base for travel in Mongolia than Kublai's city, Khanbaligh or Cambalue, the "Great Court," whence a Mongol governed the mightiest empire of Asiatic history?

PEKING TO KALGAN.

In both 1899 and 1902 I set out from Peking in early summer, my immediate objective being Kalgan, which is the point on the Mongolian border nearest to Peking. My route passed through Kuan-shih, Nan-ku, Huai-lai, Chi-ming-yi, and Hsuan-hua. It is a highway of immemorial reminiscence, and figures largely in Chinese and Mongol annals. It has been described often, and I will merely refer for a moment to the celebrated archway at Chu-yung-kuan, in the Nan-ku defile. It is of white marble, was built in the Mongol period, in A.D. 1345, and the walls are covered with Buddhistic figures carved in relief and with inscriptions, all much defaced and chipped, chiefly by the tremendous traffic through the gate. These inscriptions, which were brought to the notice of European scholars forty years ago by Mr. A. Wylie, are in six languages. Five of these languages offered no difficulty — Sanscrit, Chinese, Tibetan, Mongol and Uigur — but the sixth was unknown, and although Mr. Wylie adopted the view of a Chinese author that it was Juchen (Neuchih, Nu-chen), the national script of the Chin or Gold dynasty who followed the Kitans as the dominant power in North China in the early part of the twelfth century, it was soon pointed out that the few known specimens of Juchen writing did not help this identification. It is only within the last few years that a Fellow of our Society, a former physician to the British Legation at Peking, Dr. S. W. Bushell, established beyond doubt that the unknown inscription is really in a Tangut writing, of which few specimens are extant.

There are, according to Chinese official records, five great ancient post-roads from North China into Mongolia. Beginning from the east, they cross the Great Wall at Hsi-feng-ku (Joy Peak Pass), Ku-Pei-ku (Old North Pass), Tu-shih-ku (Lone Rock Pass), and Chang-chia-ku (Chang Family Pass) in Chi-li, and at Sha-hu-ku (Kill Tiger Pass) in Shansi. The town of Chang-chia-ku, better known to Europeans as Kalgan, a Russianized form of the Mongol name Khalga (the Gate), lies at the foot of the last ascent to the plateau, which here makes its nearest approach to Peking and the sea. It is a convenient market for a large part of south-east Mongolia, but it is pre-eminently a transport depôt, and owes its importance to the caravan trade with Urga, Uliasutai, and Siberia. But the tea transport to Siberia, which in the past has been the great feature of Kalgan trade, is declining rapidly as a consequence of the competition of the Manchurian railway, assisted by the new duties on caravan tea which are levied at Kiakhta by the Russian Ministry of Finance. Of the frontier trade routes, Kalgan is inferior only to Kwei-hua-cheng or Kuku-hota (Blue Town). There are three quarters: two south of the Great Wall, called Shang-pu and Hsia-pu (Upper and Lower Citadel), of which the nuclei are two brick-walled fortresses of some antiquity; and Yuan-pao-shan (Ingot Hill), so named from its fancied resemblance to a shoe of sycee, a suburb outside the wall to the north-west which has been the abode of Russian tea agents for the past forty years. In 1688 Gerbillon dined with a rich merchant in Hsia-pu, of which he says "on y fait un gros commerce," and no doubt for centuries before that Mongols found their way to Kalgan to barter horses and cattle for Chinese utensils and finery.

To the Kalgan gap the waters draining from some 2000 square miles of the Mongol escarpment converge, and the quantities of eroded rocks and boulders cumbering the depths of the valley and the bed of the Kalgan river (the local name is *Tung-chiao-Ho*, "Through Bridge River") suggest torrents of magnitude. Two ravines descend from the heights and join at the gap. The larger, from the north-east, is the post route, and is called the Chagan Tologai (White Head Pass); the north-west ravine, the Barun Daba (West Pass), is the caravan road, shorter, narrow, and more precipitous. Smaller ravines and depressions run into these two, and they in turn have their branches, and so on until the watershed is reached in minute folds and cuttings. The deciding rim probably averages 4800 feet above the sea, and Kalgan is 2700 feet, but the distance from the rim in places is scarcely over 12 miles, and when a monsoon thunderstorm bursts over this ramification of ravines the floods descend too rapidly for the capacity of the exit, the waters are banked up at the gap, and Kalgan barricades against inundation. What happens at Kalgan occurs along the valleys of the other rivers of Outer Chi-li—Pai-Ho and Chao-Ho (upper waters of the Pei-Ho) and Lan-Ho—none of which are navigable beyond the Great Wall. I have only seen ferry boats on any of them. But there are so many places where the passage is restricted by narrow valleys or defiles, that a smart shower of rain alters their character at once, and floods are a common scourge.

THE CHAHAR COUNTRY.

Mule-carts brought my baggage from Peking to Kalgan, and over the rim of the plateau to a Mongol encampment at Khara-usu. Here I found a caravan of camels, camel-cart, and ponies, which Mr. A. Larsen, a Swedish missionary of Kalgan, who travelled with me as far as the Kerulon, had very kindly purchased for me beforehand, and with Mr. Larsen's help it only took me a few days to make the final preparations. Close by Khara-usu is Angul Nor, the largest sheet of water in the Chahar country. In 1899 I launched a duplex Berthon on this lake, the first boat seen in this part of Mongolia, and spent some days sounding it and collecting botanical and natural history specimens in the neighbourhood. Last year Chabeh Singh, a sub-surveyor, whose services were lent to me by the Indian Intelligence Department, made a sketch of it, which places its outlines on the map accurately for the first time. It is heart-shaped; the greatest length is 7 miles, and the area about 28 square miles. I rowed across it from north to south, and found no greater depth than 4½ feet; Mr. Larsen took a line east and west, and had an exactly similar experience. The average depth cannot be much over 2 feet. The water tastes strongly of soda, is charged with organic impurities, and quite unpotable; but the cattle and ponies seem to thrive on it, and the camels love it. A sample of this water which I sent to the health officer of Shanghai, Dr. Arthur Stanley, was pronounced by him to be "highly poisonous as a beverage," and destructive of "animal and most vegetable life." I spent some time in a fruitless search for fish, and finally came to the conclusion that there are none in the lake. There was nothing living in it except a few water-fleas, and patches of a species of water-grass. The bottom throughout was blue mud or ooze, which often stank. Swans—I counted over eighty—and sheldrakes were breeding, and the Mongols said that they came every year.

The lake is merely a local area of depression dammed on the west and south by low hills, and fed by a few wet-weather streams from those hills, and by the Khara-usu river, which makes a circular sweep from the east, drains a considerable area, and enters the lake at its northernmost point. The Khara-usu river in July, 1899, was a mere trickle of running water; in June, 1902, it was a series of shallow pools. After heavy rains it swells to a width of 10 yards, and is 2 or 3 feet deep. Chabeh Singh's map represents the normal size of the lake. The nature of the east shore shows that a large expansion takes place in rainy seasons, and the Mongols told me that in droughts the lake is smaller than I have seen it.

There are between Kalgan and Angul Nor the remains of two walled cities, the first of which, Khara-balgas (Black City), dates probably from the Liao dynasty. In the Mongol period it received the name of Hsing-ho-cheng, by which it is known to Chinese at the present day. Till recently it was, like all these ancient cities of Mongolia, uninhabited—in 1872 Dr. Bushell remarked that it was "completely deserted and overgrown with grass"—but about fifteen years ago Chinese farmers started cultivating the space enclosed by the walls, and in 1899 there was a flourishing Chinese temple and a Chinese village of forty or fifty houses occupying the centre of it. A fair held yearly, towards the end of July, is one of the events of the Mongol border. The earth-walls, long flattened by the elements into mounds of gentle outline and grass-covered, face the points of the compass, and are half a mile square. They must have been 30 feet high originally, and there are traces of a 40-foot ditch running outside them, the water for which came from the Borochei rivulet close by. The north-west angle of the wall is surmounted by a small Chinese shrine, built up against an ancient Mongol *obo*, or prayer-cairn, and during the fair of July, 1899, I saw hundreds of Chinese worship at the shrine, and but few Mongols pay any mark of respect to the *obo*.

ON THE ROAD FROM PEKING TO NANKU.

Some 8 miles north-west of Khara-balgas is Chagan-balgas (White City), which has been identified with Marco Polo's Chagan Nor. It is smaller than Khara-balgas—the space enclosed is 600 yards square—but the corners of the walls and the gates, of which there appear to have been four, were faced with brick. Towards the centre there was in 1899 a large oblong heap composed of broken bricks and building rubbish, amongst which I noticed pieces of the green and yellow tiles distinctive of imperial buildings. There were traces of an exterior wall some distance outside the city. No doubt Chagan-balgas was one of Kublai's hunting or summer residences; Hyacinthe thought that it must be his Chung-tu (Mid Capital). I saw nothing of the "circular place enclosed by unhewn stones," mentioned by Timkovski, who visited Chagan-balgas in 1820. Some twenty Chinese families live under the lee of the north wall, and they have dug the bricks for their houses out of the corners and gateways. Three-fourths of the interior space is under cultivation. This is quite recent; the Chinese told me that they had come four or five years previously, but Mr. Larsen was certain that in 1895 it was uninhabited and uncultivated. I saw later on, in the keeping of the Roman Catholic Mission near Hsing-ho-ch'eng, a dragon's head in marble, and one or two other relics of Chagan-balgas, but nothing bearing an inscription.

The Great Wall, which we passed at Kalgan, has long ceased to fulfil the last of its functions, that of a political boundary. The expression Kou-wai (Beyond the Passes) applied to the region outside the wall can no longer be taken as a synonym for Mongolia. As the pressure of population in Shan-si and Chi-li increased, swarms of Chinese spread beyond it, ousting the Mongols, and gradually colonizing all the mountains which form the broad staircase to the high plains inland. Already the line of advance encroaches seriously on the plains. I had an opportunity of judging the speed of this invasion. In 1899 the Chinese settlers had reached a mile or so beyond Chagan-balgas; in 1902 I found them ploughing the virgin turf near Dabasun Nor, a pool which is 10 miles further north. All these Chinese settlements, which extend along the edge of the plateau from the Yellow river to the Khingan mountains, are withheld from Mongol jurisdiction. They are governed by special prefects, three of whom are stationed at Kalgan, Tu-shih-ku, and Dolon Nor.

On June 16, 1902, we set out from Khara-usu (Black Water), and took a north-easterly course through a Khalha *hoshun* of the Inner Mongols and the territory of two Chahar banners and the Imperial Horse Pastures, to the ancient summer seat of the Yüan emperors, Shang-tu. We made a detour to avoid the direct route to Dolon Nor, which we wished to touch at eventually to renew our stock of flour and millet, and the greater part of our route was new. Till we reached the Shang-tu Gol there was no running water. Pools and lakelets, every one of which has a name—Dabasun Nor (Salt Lake), Hatate Nor (Stony Lake), Chamin Nor (Way Lake), Hagiye Nor—abounded; all permanent or semi-permanent sheets of water, no matter what the size, are called *nor* alike by the Mongols. There were occasional stretches of steppe which rolled into the horizon, but as a rule our view was bounded by low green hills of soft outlines. Plain and hill were treeless. I saw only two or three stunted elms in sheltered clefts. Except in the Shang-tu valley the Mongol tents were sparse, although the pasture was everywhere excellent, and the cattle and horses in thriving condition. In a day's march covering a view of 80 or 100 square miles, I could count fifty or sixty tents, say forty families, or something under two persons to the square mile. From Khara-usu to the Shang-tu valley the only permanent buildings were monasteries—Khalha Sume, Khalha Hoshoin Sume, Bitirye Sume, and Ole Sume. At Mo-kherim (Bad Wall) we passed close to an earthen rampart, grass-grown, which I was told extended westward past the Kalgan-Urga route. From its antique appearance I judged it to be a Chinese defence of the pre-Mongol period.

On June 24 we camped in the south-east angle of a deserted walled town, which is marked on Waeber's map as "Kurtu-Balgasu." The Mongols living near call it Balgas simply, and know nothing of Kurtu Balgas; the Chinese name is Hsin-liang-cheng. The walls appear to have been constructed of earth only, and are now melted into a succession of grass mounds. They enclose a square of 1300 yards, and face 10° west of the magnetic north. Near the centre of the enclosure there are the remains of substantial buildings, broken bricks and tiles, and a few weather-worn remnants of cut stone, but the bulk of the interior is covered with mole-hills and green sward, which bear no traces of former habitations. Wang Yun, a Chinese traveller quoted by Dr. Bushell, who went in the suite of Kublai to Shang-tu about A.D. 1260, mentions "the new city of Huan-chou" as being 45 li from Shang-tu. The odometer attached to my camel-cart made the distance 12¾ miles, and the local Mongols called it 40 li. There is no other Balgas which so clearly represents Wang Yun's "Huan-chou."

Dondo-hota (Middle Town), a collection of thirty Mongol families clustered around a large Chinese dwelling, lies a mile to the south of Hsin-liang-cheng. I noticed here, and elsewhere in the Shang-tu valley, that many Mongol tents were protected from north winds by fences of boughs roughly plastered with mud.

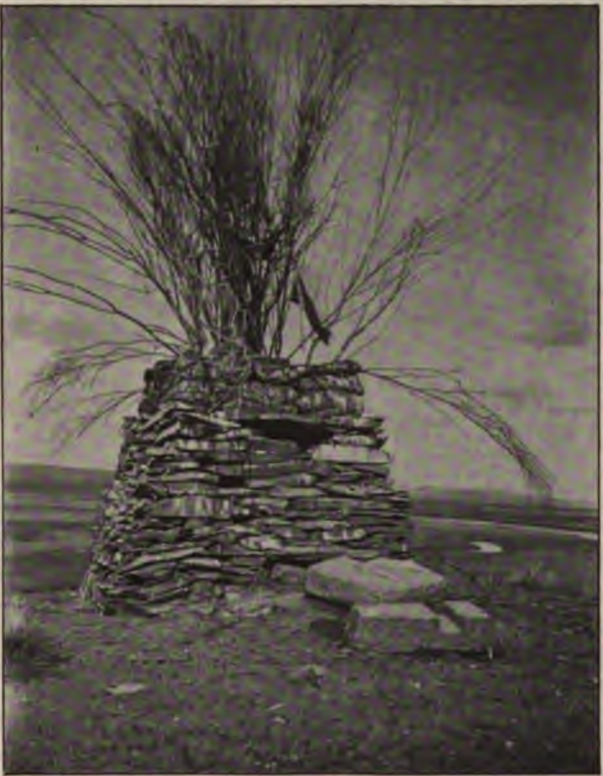
I spent the afternoon of June 25 inspecting the remains of Shang-tu (Upper Capital), or, as the Mongols now call it, Cho Naiman Sume (the Hundred and Eight Temples). In the diary of his 'Troisième Voyage en Tartarie,' Gerbillon, under the date of May 19, 1691, mentions, "la ville de Chantou où les Empereurs de la famille des Yuens tenoient leur cour durant l'été; on en voit encore les restes"; but the first description of these ruins was given in a paper by Dr. Bushell, and read before this Society in 1874. I have nothing of importance to add to Dr. Bushell's description. Since his visit some vandal lamas have collected most of the interesting marbles and stone-work and made an *obo* of them. The archway of one of the main gates, under which

Kublai himself must have passed frequently, is still standing, but I saw signs that the ruins were being drawn upon for building materials, and as soon as the line of Chinese immigration invades this part of the Shang-tu valley, the disappearance of these interesting relics will be a matter of very few years.

From Shang-tu to Dolon Nor is a short day's journey, under 20 miles, south-east over a succession of low hills. Dolon Nor (Seven Lakes), called Lama-miao (Lama Temple) by the Chinese, is the third of the great trade centres in South-East Mongolia. It was the scene of the submission of the Khalha princes to the Emperor Kang-hsi in 1691, a ceremony which Gerbillon, an eye-witness, describes in minute detail. My camp was pitched to the north-west of the town, which is purely Chinese and in no way attractive, on some rising ground between two extensive lama monasteries. One of these, Hui-tsung Ssŭ (Temple of the Gathering of the Clans), or, as the Mongols call it, Shara Sume (Yellow Temple), was erected in commemoration of the ceremony mentioned above by contributions from the Mongol princes who assembled to do homage; and soon after its foundation, Chinese traders were allowed to establish themselves a short distance off, across the Urstung Gol (a branch of the Shang-tu river), and commence the Mai-mai-chen, or "trade borough," which can now boast of 30,000 inhabitants. The other monastery, Shan-yin Ssu (Good Cause Temple), or Kuku Sume (Blue Temple), was built with a donation of 100,000 ounces of silver from the Emperor Yung-cheng, Kanghsi's son, and contains a stone memorial tablet dating from the ninth year of his reign (1732).

My first march from Dolon Nor was directed to the ruins called Chagan-hota (White Town). They are just under 7 miles by road to the north of the two monasteries. The outside walls, of what was probably an imperial residence of Kublai's of the same character as the Chagan-Balgas near Angul Nor, enclose a space 350 yards square. They are still standing in parts; the north-west angle is intact, and shows that the walls must have been 20 feet high. They were composed of two facings of rubble packed with earth, and they tapered from a breadth of 15 feet at the base to 5 or 6 feet at the top. The rubble is of smallish flat stones, laid in lime-mortar. There were evidently three gates—on the east, west, and south. A hundred yards north-east of the main enclosure there are traces of a smaller one, 80 yards by 70. There is one large mound near the centre, four smaller ones north of it, and two—evidently remains of pavilions—at equal distances south-east and south-west of it. No one lives in Chagan-hota, and my Mongol followers did not relish the prospect of camping inside it as we did for two nights. The Mongols believe that all these old palaces and cities are haunted, and that the spirits are prone to bring misfortune on intruders. It seems to be an equal article of belief that gold and valuables are to be found in all ruins, but delving is tabooed, because it would infallibly involve the neighbourhood in disaster—murrain, drought, or plague.

North of the Shang-tu Gol we entered a region of sand hillocks, which continued as far as the south shore of Dalai Nor. According to Prjevalski, the local designation of this region is Guchin Gurben (Thirty-three), but I was unable to obtain any confirmation of the name. The Chinese call it popularly the Sha-wo-tzu (Sand Nests). There is little or no population until Shibe Sume is passed. During more than one twenty-four hours we did not see a soul, and this was attributed by Mongols and Chinese alike to the prevalence of robbers, who find it perfectly easy to escape with stolen cattle or horses in this labyrinth of monticules. There was a bewildering choice of cart-tracks and paths made by Chinese in search of the brushwood and sparse timber growing on the north slopes of the hillocks (few of them were over 100 feet high), and we strayed daily. A little north of Hsi-pei-miao (North-West Temple) or Shibe Sume, we passed from the



AN OBO (KERULON VALLEY).

Chahar country ([illegible], or Plain Blue banner) into the Geshikten banner of the Inner Mongolia.

DALAI NOR REGION.

The only point in the Sha-wo-[illegible] which I could connect with previous travellers was the Shaborte Sume (Marsh Monastery) mentioned by Prjevalski. My route to the south-west angle of Dalai Nor took me almost due north, through Chagan Hota, Mohur Bulak (Blind Spring), Shaborte Sume, Shibe Sume, Barga, Sharga, and Hureko. Hureko (pronounced by Chinese Ku-li-kou, or Ku-li-keng) is the most outlying of the permanent Chinese trading settlements in this quarter. I found three small firms, who barter salt and flour for hides, wool, and cattle, and a Chinese population of forty, living in stockaded houses. They were harassed by roving bands of their countrymen, mostly fugitives from justice, who make a bare living by fishing the Dalai Nor in summer. Some of these vagabonds were deserters from the armies who fought around Peking in 1900.

Salt is obtained from many pools and lakes throughout South-East Mongolia, but there is one great salt lake (Dabasun Nor), a week's journey north-west from Dalai Nor, which is the most productive. I constantly came across well-beaten cart-roads (*yen-lu*, "salt roads"), leading to this lake, and interminable trains of rude ox-carts were occasionally sighted crawling to Dolon Nor with loads of crude salt. The wheat and oat flour used in the Mongol trade hereabouts comes from Chin-peng, a thriving Chinese town situated in a farming district some 25 or 30 miles south-east of Dalai Nor, which, originally a camp of gold-miners clustered around a Geshikten monastery, has grown up in the last half-century, and must now possess ten or twelve thousand inhabitants. The Mongol name for Chin-peng (Gold Tent) is Puro Hota.

We camped for a couple of days on the shore of Dalai Nor, just beyond the sandhills of Geshikten, and within sight of a prominent Buddhist *stupa*, known as the Chagan Suberga (White Pagoda). We were now on the border of the Abagha Hoshun. Three rivulets discharged into the south-west corner of the lake—one close to Hureko, called the Hureko Gol, another passed on the way to our camp, and the Hore Gol, which came from the White Pagoda to a point 500 yards north of our camp. Dalai Nor is a considerable sheet, 16 miles from north-east to south-west, and about 10 from east to west. The water has a soda flavour, but it is greenish, clear, and—in the form of tea—drinkable. There are no boats on the lake, and I was unable to examine and sound it as I had hoped. The whole of the south-west shore shelves gradually, and, by all accounts, the lake is generally shallow, though the Chinese fishermen (who in these matters are not reliable informants) were positive that it was deep in the centre. The same informants were enthusiastic [illegible] undance of fish of two or three kinds (I myself saw only one species of carp), but lamented that religious scruples of the Abagha prince interfered with the prosecution of a lucrative fishery. The prince, as a fervent Buddhist, objected to the lives of the big fish being taken, and in permitting the Chinese to fish, made it a preliminary condition that all the large ones caught should be returned at once to the lake. The bottom was sandy. I saw some reeds on the south shore, which was hilly, and there were many water-birds—geese, ducks of two or three species, sheldrakes, teal, plover, lapwing, redshanks, snippets, gulls, and terns. I noticed also a fishing-eagle, kites (*Milvus melanotis*), buzzards (*Buteo desertorum*), and peregrines, chats (*S. œnanthe*), larks (*Melanocorypha mongolica*), pipits, ravens, magpies, sparrows, swallows, and martins.

Gerbillon touched at Dalai Nor in 1689 in his remarkable journey with Father Pereira and the Chinese Ambassadors, who were sent to Nertchinsk to conclude the first treaty with Russia, and he mentioned the ruins of a "pagoda" and a marble monument with Chinese inscription, of which he was unable to take a copy. Prjevalski, who circled Dalai Nor in 1871, did not mention ruins, and I concluded that they had disappeared in the course of the two intervening centuries. I was agreeably surprised to hear from our Mongols that there was a *balgas* close by our camp, and I promptly inspected it. It lies 1½ miles from the south-west angle of the lake under the *stupa* above mentioned. The outer walls are a rectangle 900 yards from north to south, and 800 from east to west, and were originally some 20 feet high and 30 broad at the base. They are of sandy loam, and are now a succession of longitudinal mounds, which, from a quarter of a mile off, might be mistaken for ordinary low sand-dunes, and I can easily understand Prjevalski's omission to notice them. The walls face the points of the compass very nearly. Within there is no general spread of ruins as in Shang-tu, and I formed the opinion at once that the original contents were a few important buildings or a royal residence. In the middle of the northern half there is a series of ruins of a palace or temple. Of one large hall, which was 80 feet square, I counted forty-eight diabase plinths, each 4 feet square, still *in situ* in two rows; and in rear of it there is a rectangle 55 feet by 45, formed of fifteen worked plinths of white marble, much damaged, on which no doubt rested the pillars of the most important structure. In front of these ruins to the south are two black stone (diabase) lions, and more to the south still are the almost unrecognizable trunks of two massive stone tortoises, near which are lying in the grass two mutilated monuments of white marble, with Chinese inscriptions of the Yuan period. In the north-west angle there are two raised mounds, with plinth stones scattered about, and the remains of what must have been a special raised enclosure of considerable dimensions; inside it there is the solitary tree of this deserted city, an aged elm, peopled by noisy starlings and sparrows. There are traces of three gates in the east, west, and south walls, and inside the west gate remains of walls of inferior buildings can be traced. In the south-east angle I noticed two small lions hewed out of black volcanic stone, and here and there in the east half of the city there are ruins of smaller edifices. No portion of stone wall remains standing; the place must have been razed and the monuments overthrown and defaced. I saw pieces of the royal blue tiles which I found in Shang-tu and in Kurtu Balgas (Hsin-liang-cheng).

It was evident that Gerbillon's description did not fit these ruins, and I was under the pleasing impression that I was the first European to notice them, until I reached Irkutsk, in November last. There I bought M. Pozdnyéev's new work on Mongolia, and from the second volume I learnt that in 1893 he had seen the marble monument answering to Gerbillon's description, and also the ruins I have mentioned above. M. Pozdnyéev quotes from a well-known Chinese book, 'Meng-ku Yu Mu Chi' (Records of the Mongol Nomads), a passage which clearly refers to this place. In A.D. 1271 Kublai authorized the building of this city, and it was named Ying-ch'ang Fu. Thither the last of the Mongol emperors, Toghon Timur, fled before the conquering Mings, and there he died in 1368. These old ruins were then the last retreat of the Mongol Court south of the Gobi. The local Mongols called them "Hota" (town) simply, know nothing of their history, and were not much interested when I told them that the Chinese dynastic title of Kublai occurred on one of the marble monuments.

We followed the whole length of the west shore of Dalai Nor. For a time our route passed over rolling hills close by two inferior monasteries, Abagha Sume and Dalai Sume, and then a level plain commenced, dotted with clumps of dust-covered *deris* (*Lasiagrostis splendens*) near the lake, but northward we trod on lovely sward, sprinkled with magenta clover, yellow vetches, and tall thistles. The plain rose into gentle heights on the north horizon. Evidently the lake had extended over it at no distant period. There was a small *inselberg* east of us in the middle of the plain, much water-weathered, and the edges of the low hills to the north-east were water-worn. On the slopes of these hills I counted a herd of five hundred *huang yang* (*Antilope gutturosa*), the largest seen by me in Mongolia. The east shore of the lake, which was easily visible from many eminences, shimmered in the sunlight—the "saline plains" of Prjevalski.

Not far from the north shore we passed a low earth-mound, scarcely noticeable, running east and west, with small hummocks at regular intervals marking the sites of towers or bastions. The appearance of this rampart, known locally as the Mo-kherim (Bad Wall), suggested to me a greater antiquity than the walls of Ying-ch'ang Fu, and no doubt it is an ancient Chin or Liao barrier. I saw it continue eastward for 7 or 8 miles, and pass out of sight over the hills. The Mongols did not know where it ended, either eastward or westward, and from their remarks I was inclined to believe that it was the same wall which we passed at Mo-kherim in Chaharia, and which further west again is found crossing the Kalgan-Kiakhta caravan routes.

East Hochid and Uchimuchin.

Three days' travel north-north-east took us out of the Abagha district into Jun Hochid (East Banner of the Hochids). The Shilin Gol, a clear stream with a bed 20 yards wide where we passed it, waters the country immediately to the north of the Dalai basin. Most of the river-bed was dry, and the water trickled through sandy reaches, but here and there it gathered into a rapid current over a foot deep. It flows westward, into a lake, the Mongols said. Near Lama Sume there is a nameless *balgas*, a quarter of a mile square. I observed no trace of stone or brick buildings, and the line of low mounds marking the walls is overgrown with *deris*. In the Lama Sume valley I saw wild rhubarb for the first time, and a little further north I found a band of Chinese from Chin-peng collecting liquorice, which is a common plant on the lower hills. All the Abagha population was clustered around Dalai Nor and in the Shilin Gol valley. I counted fifty or sixty tents about the north shore of the lake, and saw at least thirty in 3 miles of the Shilin Gol, the river pastures being particularly green and abundant; elsewhere we rarely saw a traveller, much less a tent.

VIEW OF A STREET IN URGA.

Want of water in the south part of Jun Hochid led us to take a more easterly curve through Haliutai, a lone spring bubbling from the rocks in a narrow gulch, to the upper valleys of the Chirin Gol. This is a rivulet of excellent water, formed by two streams, which flow from the Khingan mountains in a north-westerly sweep through the greater part of Jun Hochid. We followed it for two days, past four temples—Tatir Sume, Lamahai Sume, Wangin Sume (Prince's Temple), and Khaton Sume (Lady's Temple). The volume of water decreased—at Khaton Sume it was the tiniest of brooks—and, according to the Mongols, the Chirin Gol disappears in the sands to the north-west of our route.

Near Wangin Sume we halted for a night, at the summer encampment of the Prince of Jun Hochid. It was typical, and a description may be of interest. The encampment faced the south-east, the usual orientation of Mongol tents (I found by experience that it was much the best for all weathers). In front there was planted a 20-feet pole, coloured red, with a turned top, gilt; a few paces in rear of this were two similar poles to right and left, bearing a line of pink and white prayer-pennons; and 15 yards behind was pitched the first tent. It was of the finest new dull white felt, the circular top covering was embroidered and stitched, and it was surmounted by a gilt knob of turned wood only seen on the abodes of chiefs of banners. The old prince had died a few months before, and the son, an intelligent-looking youth of eighteen, kept this chief tent closed during the period of mourning and pending his investiture by the Court of Peking: in any case, it would be used only on occasions of much ceremony. Close behind it there were two tents in line, one large and new-looking, and these were also untenanted in consequence of mourning. Further in the rear in one row were five tents, in which the young prince and his family were living, and behind these again were three tents for servitors and dependents. Ponies were tethered and picketed on the left front, and there was a constant passage of men and women, mounted and on foot, from the living-tents to the large droves and herds which were cropping the short grass of the steppe, and to the Lamahai and Prince's Temples. I called on the young prince (the first foreigner he had seen), and was ushered by him into one of the five tents evidently set apart for visits. It was carpeted with felts, which were hemmed and stitched, and over them were laid square wool rugs, on which we sat. Around the wall of the tent were red varnished boxes, glaringly new, with large brass hasps and Chinese padlocks, and an iron brazier with sheet-iron top, on which I noticed the fag-end of a European candle, stood in the centre. The usual milk tea, a flavourless beverage of doubtful purity and only palatable in stages of extreme thirst, was served, and a plateful of a variety of cheeses, which looked as if they had often done duty on similiar occasions, was offered to me. I got an impression that the young prince was not affluent. His suite was poorly dressed—some were ragged—and the tent bag and baggage was hardly worth £20. With the exception of four, all the princes and *jassaks* of the forty-nine banners of the Inner Mongols are descendants of Jinghis or his brothers, and this young Hochid prince (according to the *Ta Ch'ing Hui Tien*, 'Institutes of the Manchu Dynasty') is of the family of Torobolod, or Turubolod (*Sin*, *T'u-lu-po-lo-t'e*), who was sixteenth in descent from Jinghis himself.

A guide sent to us by the Hochid prince led us from Khaton Sume and the Chirin Gol on a straight course to the Khalha river and Khailar. To Balbur Nor we passed over a belt of sand hillocks similar to those of Geshikten, by swampy pools edged with sedges and rushes and swarming with mosquitoes, and through moist troughs studded with small elms and dwarf willows. Balbur Sume, a large temple of seven hundred lamas and a *gegen* (minor lamaistic incarnation), lies north-east of the lake, and here I noticed three well-worn caravan tracks leading from Manchuria to the middle course of the Kerulon. In the morning of July 15 we entered the territory of Ikhe Uchimuchin (Great Uchimuchin) under the leadership of a delightful old noble (*taichi*); on July 21 we reached Baga (Little) Uchimuchin; and on July 23, within three marches of the Khalha Gol the boundary line of Inner Mongolia was crossed, and we entered Khalha territory. Uchimuchin resembles the Chahar country, but the plains dividing the low, rounded hills are sandy, arid, or nitrous, in parts almost desert. For two or three days the want of pasture gave me some anxiety. The season was exceptionally dry, I was told, and the Mongols in some places were oppressed by the severity of the drought, which had killed large numbers of sheep. Uchimuchin is famous for ambling ponies, and certainly the breed was noticeably larger and finer than in Hochid, Abagha, Geshikten, and the Chahar country, but it is much exploited for the horse-markets of Manchuria (Ku-liehrh appeared to be the principal of these), and prices of good-looking animals were absurdly high. In Uchimuchin primitive carts of wood, which came all the way from the Khalha river, were in general use. A slender ring of cast-iron bushing inserted in the nave of the axle to work on is the only bit of metal used in the construction of these vehicles. Every *ail*, every tent had its carts; special water-carts, travelling carts roofed in with felt, and open carts for collecting *argol* and general purposes. Oxen were the usual draught animals, and the drivers in short excursions were invariably women.

I was told that woman holds a very inferior position in Mongolia, but I could not satisfy myself that this was so. The life she leads is inferior in Mongol estimation: milking, cooking, needlework, felt-making, are less agreeable occupations than the eternal gadding about on horseback, herding or visiting, in which the men pass their time. There is little scope for the display of feminine qualities, nor does the nomadic life foster these. There is nothing radiant about the Mongol woman; with rare exceptions, she is withered and slattern, or young and slattern. Not even the daughters of princes can be said to "exist beautifully." No doubt the legal position of the wife in a family is an inferior one, at any rate so long as her mother-in-law is alive, but her actual place and influence depend on herself. A European cannot see much of the country without noticing the great freedom of intercourse between the sexes. The movements and actions of the women are, from the character of the life, completely untrammelled by the conventions to which we are accustomed. Women and girls making journeys on horseback or in carts, alone or in the company of men not their kinsmen, were to be met with commonly; our tents were visited by merry wives and maids eager to inspect the stranger's belongings, and they sat down as a matter of course in the circle of our Mongol henchmen and were in no way preoccupied by their own innocence. Husbands and fathers are constantly absent from their tents, sometimes for long periods, leaving the wives and daughters to look after themselves.

Marriage has no religious significance. It is a civil contract, whose binding force is the mere will of the parties. The husband or the wife seems to be at liberty to dissolve it for any reason that appears good to him or her, and there is no restriction on the re-marriage of either. Monogamy is the ideal basis of the family, such as this is in Mongolia; but in practice it is not allowed to interfere with polygamous experiments when the means to indulge in these are not wanting. Glaring obliquity in these matters is held in check by the fear of exciting interference from the wife's relations, and then a woman divorced takes her dowry and personal property with her. But there is little or no moral censure of concubinage. I once came across a Mongol lady with two husbands (she was the best man of the three), and though the *ménage* was considered unusual, there was no social condemnation.

Near Burte Nor, which is in Baga Uchimuchin but close to the Khalha border, we joined the main caravan road between Khailar and Dolon Nor. The traffic was inconsiderable, but striking after the loneliness of the previous three weeks: two small Mongol trains of ox-carts bearing timber to Ikhe Uchimuchin from the Khalha Gol, and a large caravan (fifty carts) belonging to Chinese traders of Khailar, who were transporting the season's collection of hides, sheep-skins, and poles to Dolon Nor. Khailar being a station on the Manchurian line, I asked these men why they did not use the railway; they complained of the cost of carriage, which would swamp all their profits, but I gathered that their real objection was the difficulty of changing long-established habits of business.

KHALHA RIVER.

On Saturday, July 26, we pitched camp on the Khalha river, near a prominent bluff of limestone named Krei Ul, which marks the boundary between two Khalha banners of the Tsetsen Khanate. Here the river emerges from the hills and splits into two channels and some back-water creeks. The bed is gravel and sand, and the water soft and pure, and running in places to 4 or 5 feet of depth. At the ford in front of our camp it was deep enough (2 feet) to cover the axles of the ox-carts, and from the way the cattle and camels crossed it at will to pasture on either bank I gathered that it was not difficult to find a fording-place. From the top of Krei Ul I saw that the river wound north-westward between sandhills and bluffs, its course marked by a narrow *bourgas* (thicket) of willow, hawthorn, elm, currant, etc.; that the river basin, as distinct from the unwatered grey-green uplands, averaged under 3 miles broad; that this basin was moist, emerald

THE BOGDO (LAMA POPE OF MONGOLIA).

meadow, interspersed with marshes and pools; and that it was evidently subject to inundation during strong summer freshets. It was the most populous part of Mongolia which I had seen up to then. I counted two hundred tents in a day's march, nearly all on the north side of the river; the flocks and herds were continuous; and the tents were nearly all new and good. Eastward, in the direction where the celebrated Soyelki Shan is marked on the Chinese maps (I know of no European who has visited this mountain), I noticed hills of no considerable height—none more than 800 or 1000 feet above the river-level.

It may be useful to connect my journey briefly with the work of previous travellers in this region. From the Dalai Nor of Inner Mongolia to the Khalha river the greater part of our route lay eastward of Gerbillon's and westward of those of recent travellers. Fritsche, the pioneer of travel in the Khingan mountains, started from Hei-shui (Huc's Valley of Black Waters) on June 3, 1873, and arrived at Khailar on the 29th of the same month *viâ* Pai-t'a-tzu (White Pagoda) and Taikel Sume; in 1882 Lieut. Evtyugin followed the caravan route from the Argun river to Dolon Nor; Colonel Harnack of the Russian General Staff examined the Khingan mountains in the summer of 1887, and eventually reached Khailar (I understand that no account of this journey has been published); in 1891 Colonel Putiata, the Russian Military Agent in China, starting from Tientsin, explored the same range as far north as Entsigen Sume, a monastery on the west slope in lat. 45° N.; Dr. Franke's journey in 1896 lay largely along the route of Fritsche, I believe; in June, 1899, Potanin travelled eastward from Bur Nor (Buir or Buyur Nor) into the Aru-Khorchin country; and in the autumn of 1899 the expedition of Dr. Damaskin, to investigate the spread of bubonic plague in East Mongolia and North China, passed from Ganjur Sume south-eastward into the trans-Khingan region.

We followed the south bank of the Khalha river for four days to a crossing-place near the embouchure into Lake Bur. The most remarkable place in this section of the river is Ikhe Borhan Sume (Monastery of the Large Buddha), which was being repaired by Chinese masons and carpenters imported for the purpose from Dolon Nor. The enterprise of these men can be judged from the fact that they made the journey in a month on foot, practically working their way, for they started with light purses. They told me that their remuneration was equivalent to seven or eight ounces of silver (£1) a month. Everywhere in East Mongolia the temples and monasteries are repaired by itinerant Chinese workmen, the Mongols themselves being unable to do such work and unwilling to learn. Ikhe Borhan Sume is built on the incline of low hills bordering the river, and contains a recumbent image of Kuan-yin (Avalokiteswara), which lies in an open sloping courtyard, and is conspicuous for miles. The figure is a rude fabrication of stone and mortar, whitened with lime and ornamented with coloured washes, 40 feet long and 30 broad, and more antique than most of the East Mongol shrines. Outside the main buildings a rough low wall of piled stones protected a curious border of Tibetan letters—each letter was 15 feet square, and neatly formed of stones hammered into the hillside—which ran along the edges and top of the temple enclosure. I distinguished this Tibetan prayer with my Zeiss glasses from a distance of 2 miles. Close by the river there is a very large and sacred *obo* and the remains of an ancient shrine which had suffered from inundation.

Here I met an itinerant Russian trader, with a Buriat interpreter, who was bartering Russian cloths, purple and red cottons, copper kettles, enamel ware, tinned ladles, matches, etc., for cattle, sheep, and wool. It was a new venture, and he was not entirely satisfied with the success of it. From him I received confirmation of a report which had reached me a few days previously that cholera was rife in Khailar.

BUR (BUIR OR BUYUR) NOR.

At our point of crossing near the Bur Nor the Khalha river was split into two channels; the broader was 120 yards across, but shallow. Neither it nor the narrow channel, which was only 20 yards broad, ran deeper than 2½ to 3 feet. West of the crossing a thick growth of dwarf willow hid the view. The country was perfectly flat, and very slightly raised above the level of the lake. We camped at Khalha Hoshoin Sumé on the Ursun Gol, which carries the overflow from Bur Nor to Kulun Nor; so slight was this on August 1 that I could scarcely discern the trend of the current. I followed the Ursun to the lake, which, though only 3 miles in a direct line south from the monastery, was quite invisible from it. At Khalha Hoshoin Sume, this river was 100 yards wide, and easily fordable. It winds in gentle curves, spreading into a morass in one or two places, and the stream broadens as one nears the Bur Nor. Where it leaves the lake there are two tiny islets, and it was sufficiently shallow to allow a drove of ponies to take refuge in it from the flies. A little east of south and half a dozen miles off a thicket of dwarf willow marked the place where the Khalha Gol disembogues. Across the lake to the west, an imposing yellow mass quivering in the belt of heated air, was Asar Sume, a Barhut monastery. From west to south the Bur Nor extended out of sight, and the slight breeze there was had lashed it into a thundering sea. There is not a boat on the lake, and no one has ever ventured to cross it. The Mongols, as usual, said that it was unfathomable. The shores were covered with wild-fowl—geese, ducks, plovers, gulls, terns, lapwing, cormorants, waders of many species—and a few conspicuous ospreys hovered over the Ursun, which was alive with fish. Two Mongols were spearing successfully—the only Mongol fishermen I have seen—and I bought some burbot and an 8-lb. carp from them.

At Khalha Hoshoin Sume we passed across the Ursun Gol into

Barhut territory. The Barhuts (the local pronunciation is Barûkh) occupy the region north of the Khalha river and Bur Nor, are organized into eight banners under much the same conditions as the Chahars, and are controlled by a Manchu official usually stationed at Khailar, which is known throughout East Mongolia as Amban Hota (Governor Town). The Barhut banners were summoned to arms in 1900 to oppose the Russian occupation, and from the temporary sadness which overtook most Barhuts when the subject was broached, I gathered that the experience was unpleasant. I heard later that the Khailar Amban had provoked hostilities by attacks on inoffensive Russian traders, in which the Barhuts displayed some audacity, but that the first skirmish with Russian troops—a short affair in which two or three hundred Mongols lost their lives—sent the Barhuts to their tents and tranquillized North-East Mongolia completely. I have small doubt that the Chahar banners could be pacified just as easily.

It was my intention to follow the Ursun Gol to Kulun Nor and to make an excursion to Khailar before turning westward towards Urga, but at Ulan Nor I heard that the cholera was more virulent than ever, that it had reached Ganjur Sume, a trading centre only 35 miles off, and that cases had occurred on the Ursun; and we saw Mongols trekking night and day westward in consequence. This form of cholera is not dangerous to Europeans who are careful of their diet, but I felt that it was hopeless to expect the necessary amount of caution from my followers, and forthwith decided to make for the Kerulon. Ulan Nor (Red Lake) is the "Oulan Poulac" (Red Spring) of Gerbillon. It is a long, narrow lagoon running westward from the Ursun and renowned for its pastures. Here in 1698 Gerbillion spent a week in the suite of the High Commissioners who were sent by the Emperor Kang-hsi to hold the first council of the Khalha princes, and Gerbillon's journal remained for two hundred years the solitary description in European literature of the Bur Dalai (Coupled Oceans), as this lake-region is called by the local Mongols.

On our way north-west to the Kerulon I ascended a prominent hill named Bogdo Ul (God's Mount), and obtained a remarkable view of the stretch of country between the lakes. Bogdo Ul rises only 1000 feet above the level of the Ursun Gol, but it towers over all the neighbouring heights, and was first noticed by me from an eminence south of the Khalha river 50 miles away. It is a limestone rock, surmounted by a collection of *obo*, which are much visited by pilgrims. A few gnarled elms grew in the folds and gave shelter to some buntings and warblers, and I saw dwarfed specimens of wild rhubarb amongst the scanty herbage. To east and south the view was unbounded, and was lost in a dim grey rift, which I took to be the Bur Nor; on west and north it was limited by hills, those on the north being high and bold. With my glasses I distinguished the brown marsh land of the south shore of Kulun Nor and the waters of the lake beyond it. I failed to observe a trace of the Kerulon, and I understood the reason when I reached the bank of this famous river next day.

THE KERULON VALLEY.

My acquaintance with the Kerulon (pronounced Khérelon by the Khalhas) began on August 5, at a point less than two marches from its entrance into Kulun Nor, and 5 or 6 miles south-west of the Altan Emul (Golden Saddle), a pair of brown hills famous in Mongol legend, between which the river flows. With the exception of one large bend which we cut across, we kept along the river westward for 300 miles, to the seat of the Tsetsen Khan; passed it further west on September 2; and in the third week of September I followed it once more from the neighbourhood of Jun Khure to one of its sources in the Kentei mountains.

THE MERGEN PRINCE AND HIS FAMILY.

Travellers in the Kerulon valley, excepting Gerbillon, have all been Russians. In 1870 the brothers Butin, and in 1882 Evtyugin, passed from the Siberian border through Sam Beise Urgo directly south to Dolon Nor; in 1893 Pozdnyéev crossed from the Khingan mountains (Pai-ta-tzu) north-west through the Middle Kerulon (Dalai Beise) to Jun Khure; Colonel Strelbitsky journeyed from Urga to Khailar in 1894 (the itinerary of this journey has not been published); Klementz visited Jun Khure and the Upper Kerulon in 1895; and in 1899 the Damaskin expedition before mentioned travelled from Urga to Ganjur

Sume, which is a couple of marches south-west of Khailar. (A preliminary sketch of this journey from the pen of M. Palibin, the botanist of the expedition, has appeared in the *Izvestia* of the Imperial Russian Geographical Society for 1901.)

The Kerulon is the Jordan of the Mongols. It is an inconsiderable river, but the longest in the vast arid Mongol highland, and the permanence of the pastures along its banks has always attracted a large share of the nomad population. Most of the princes of the East Khalhas (Tsetsen Khanate) keep their headquarters on or close to the Kerulon. An irregular belt of fresh green meadow, blotched by occasional brown marsh, follows the course of the stream, and varies from a mere riband to 4 or 5 miles of width; outside the meadows there is the ordinary steppe, often nitrous, or low hills, granite or sandstone, of a less rounded type than in East and South Mongolia. Near Altan Emul there were two channels wriggling through the meadows a short distance apart, the largest 18 yards broad and unfordable; the current was dark and troubled, and ran 3 or 4 miles an hour. Chagan Dure Nor (the Doure Nor of D'Anville's map) is a lagoon formed by overflow from the river. Dwarf willows line the banks at intervals, but there is no trace of forest vegetation on the hills, which are covered with sparse grasses, artemisia, and wild onion.

At Mergen Ul (August 11) the Kerulon is confined for a couple of miles in a gorge of sandstone hills, through which the stream, still coloured by dark alluvium, rushed with increased current. The boundary between the Barhut banners and the Tsetsen Khanate was passed a few miles west of Mergen Ul, and on August 13 we arrived at Sam Beise Urgo, which is marked on Russian maps as "Kerulon." The names of any but the very prominent physical features are always doubtful in Mongolia, but the traveller has special difficulty in dealing with the political subdivisions of the Tsetsen Khanate. To give an instance: For years I had heard at Peking of a district called by Chinese Minchasa, from which excellent specimens of the Mongol pony came to us regularly. I never could discover exactly where it was; my Chinese informants could only say it was "behind" and "very far," and none of the Mongols I came across had ever heard of it. It was only when I was within a day's march of Sam Beise Urgo that I learnt that the district known to the Mongols as Sam Beise was identical with the Chinese Minchasa. The subdivisions of the Mid-Kerulon country are named after the chiefs of the moment, and Minchasa is a Chinese pronunciation of Min Jassak (Chief Min), the grandfather of the present prince (named Sanselei Dordji), who is styled shortly Sam Beise (Prince Sam or San). Min Jassak ruled for a long period, and the Chinese traders, who are accustomed to attach permanent names to places, continue to use the designation by which this part of the Kerulon valley became first known to them.

Sam Beise Urgo (seat of Prince San) is the principal trading-place on the Kerulon; caravan routes from Urga, Khailar, and the Siberian and Chinese frontiers pass through it. There are two large monasteries on the north bank of the river, and in the neighbourhood live the representatives of forty Chinese firms of Peking, Kalgan, and Dolon Nor, who patiently barter silks and miscellaneous luxuries for cattle, ponies, hides, and wool. The oldest of these firms had commenced business on this spot seventy years previously. During the Boxer convulsion of 1900 they were all plundered and driven away at the instigation of some enterprising Russians, and at the time of my visit the prince and his subjects were performing, under pressure from Peking and Urga, the disagreeable duty of indemnifying the sufferers, whose claims, of course, exceeded the most sanguine estimates. Curiously enough, I had met close to Khara-balgas in Chaharia a band of the chief offenders in this robbery, who were under escort to Peking for trial and punishment —it was a striking illustration of what the Chinese Government can do in the administration of justice when they are in earnest. These men had ridden 1000 miles, and would ride 200 more, on their own ponies, to expiate an offence of no special enormity, and the duty of escorting them was entrusted to a few of their own friends and neighbours.

At Sam Beise Urgo the Kerulon was 30 to 40 yards wide and easily fordable; the bed was sandy, and the water fairly clear. I noticed a "dug-out" at one of the fords, and was told that it was usually required during summer freshets. We crossed the river at Sam Beise, and followed the caravan route along the north bank through half a dozen tribal subdivisions to the seat of Tsetsen Khan, who is *primus inter pares* of the East Khalha princes.

The ruins of Para-hota (Tiger Town) were reached on August 20. They were seen by Gerbillon in 1698, and his short description might stand for the present day. There are "grands pans de muraille de terre;" but he exaggerated the extent. I paced two sides, and found the enclosure a rectangle of 1600 yards by 1400. The earth-walls are now long grass-grown mounds, 4 to 5 feet high in the centre, and 30 broad, and outside them there are traces of a ditch. Three hundred yards from the centre of the west wall and outside the enclosure there is one of the "pyramids" of Gerbillon. It is a *dagoba* of brick, and it seems a marvel that a structure of the kind, which was "half-ruined" in 1698, should be erect in 1902. It is crumbling, but still stands, and its 40 feet of height make it a prominent landmark. Inside the city and some 200 yards from the centre of the south wall there is the other of Gerbillon's pyramids in much the same condition. It is also a *dagoba* or *chorten* of brick, 30 feet high. Near it I observed a large mound, 30 yards square and 4 feet high, of building *débris*—rubble stones, broken bricks, and fragments of marble, but no blue tiles or potsherds. Besides this I saw a few heaps of stones, which might have been the sites of buildings; but the rest of the enclosure was a flat expanse of steppe, which could not have been much built over at any time. Para-hota (Klaproth rendered it Bars-hotun, from a transliteration of the Chinese ideographs) is a relic of the Yuan dynasty, and is said to have been founded by Toghon Timur in the middle of the fourteenth century.

The Khalha chieftains, whose seats I had an opportunity of examining—Sam Beise, Batur Jassak, Akhse Wang (these two chiefs had died recently), Dalai Daichin Jassak, Tsetsen Jassak — were housed in the national dwellings, Mongol *gher* (circular felt tents); but the residence of the Tsetsen Khan is a permanent brick-and-tile structure of the Chinese type, and if it were not for a private chapel built into the south-west angle, distinguished by red walls and a gilt ornament on the roof, I should not have hesitated to class it as a second-rate Chinese yamen. All these chiefs live in the neighbourhood of their territorial monasteries, which are the only fixed habitations here as elsewhere in East and North Mongolia. They are, as a rule, of brick; along the Khalha and Kerulon I saw a few which were almost wholly of timber. In most there are pavilions and porticoes differing slightly from those of Chinese Buddhistic temples, but the design of the principal chapel is often pure Tibetan.

Nearing the Tsetsen Khan's palace I observed, tethered to two long lines in the open plain, some forty ponies, of all ages, from two-year-olds upwards. It was the racing-stud of the prince, and the most renowned in Mongolia. Racing is the national pastime; it is, in the main, a fair-weather sport. From May to August pony races are the attraction at the temple festivals and fairs throughout East and North Mongolia, and most considerable owners train a selection from their speediest ponies for the local meetings. A racing-stud of dimensions commensurate with rank and wealth is the proper appanage of a prince or *jassak*, and his "string" usually includes some of the fastest beasts of his district. The races are never under 10 miles long; the "Derby" of Mongolia is a contest over 30 miles of rough steppe. There are prizes to winners, rarely of tempting value; in the Chahar country the "stakes" was usually an ounce or two of silver (2*s.* 6*d.* or 5*s.*). I constantly heard of matches between rival owners proud of the reputation of their stock, but seldom of serious wagers on the result. It is worth remembering that Mongol races are usually run under ecclesiastical auspices. A race-meeting I attended in the Chahar country in 1899 was presided over by the local *gegen* (avatar), and the competing ponies were mostly owned by lamas. The great races which take place yearly at Urga are held under the direct patronage of the Bogdo (Lama Pope of Mongolia), who becomes the owner of all the winners. A horse-race with a bishop in the judge's box, a public chiefly clerical, no bookmakers or betting, and nominal prizes, is a phenomenon entitled to a little attention from an Englishman.

On August 29 we broke camp from the Tsetsen Khan's headquarters, left the Kerulon, which continues south-westward for another 100 miles before turning sharply to the north, and steered a direct course for Urga. The Taragilch Gol, the first perennial affluent of the Kerulon met with, was passed between two notable hills called "The Lord" and "The Lady" (Noyon Ul and Khaton Ul), and thenceforward with a few short intervals of plain we were constantly making fairly sharp ascents or descents, until the Kerulon valley was struck again. The higher hills were granite, and they appeared to burst through strata of shale and slate; the castings from the many marmot burrows were invariably a sharp gravel of shale or slate. The noteworthy *cols* were the Hannungin Daban (3700 feet) and the Joldungin Daban (4000 feet), both of which taxed the temper and strength of the cart-camel. From the Joldungin Daban we descended into the narrow valley of the Chinkir Gol, another affluent of the Kerulon, and west of it on Sibir Ul we saw

STONE PILLAR WITH OLD TURKISH INSCRIPTIONS (TOMB OF TONYUKUK, NEAR URGA).

for the first time in these parts a slender fringe of pine forest. At the Tsetsen Khan's seat the Kerulon was over 100 yards wide, but fordable everywhere; the bed was sand and gravel, and the water still clouded with sediment. When we passed it on September 2, it was split into two swift clear streams a mile apart, both of which were formidable obstacles to carts. On September 4 we crossed the water-parting into the valley of the Tola, and next day reached Urga and the bounteous hospitality of my friend, Mr. von Grot, and other members of the Russian colony.

URGA.

Urga is the religious and administrative centre of North and East Mongolia. It has been often described, and I fear that I cannot, in the limits of this paper, usefully add to previous descriptions, except, perhaps, on one point. I have already mentioned the "Bogdo." He is the pontiff of the Lamaistic Church in North Mongolia, is popularly venerated as the third in importance of the great avatars, or "living gods," coming after the Dalai Lama of Lhassa and the Pantshen Lama of Tashilunpo, and occupies a political position in the Mongol world analogous to that of the Popes of mediæval Christendom. The ecclesiastical title is *Cheptsun Damba Khutukhtu*, which was originally conferred by the Dalai Lama of Tibet in A.D. 1653 on a son of the Tushetu Khan. This prince, the first "Bogdo," was the St. Paul of Mongol Lamaism, and is known in Mongol history as Undur Gegen. Under his advice the Khalha tribes gravitated to China, rather than to Russia, in 1688, when the attacks of the Kalmucks under Galdan threatened their existence. He is the "Grand Lama Houtouktou" who figures so largely in Gerbillon's description of the assembly of the Khalha princes held by Kanghsi at Dolon Nor in 1691. Ever since his death in 1723, the Urga pontiffs have come from Tibet, and the present Bogdo, the eighth "incarnation" living in Mongolia, is the son of a steward in the Court of the Dalai Lama of Lhassa. He was born in 1870, and was invested and brought to Urga when a child of four. His education does not seem to have fitted him to fill the position of a living deity with dignity or wisdom, and since he passed from tutelage the demands of his court on the purses of the Khalhas have become a burdensome tax. I was a trifle surprised to learn that he was married and openly appeared at festivals with his wife and child. Devout Mongols who are asked to explain this mode of life, singular in the head of a celibate church, assert that it is a subjective hallucination only apparent to the unfaithful.

THE KENTEI MOUNTAINS.

After arranging for the disposal of my camel caravan, I made a rapid journey with Mr. von Grot through Jun Khure to some gold-mines on the Terelchi Gol, 150 miles north-east of Urga. The Terelchi is one of the upper feeders of the Kerulon, and the gold-mines here and on the Iro river (a feeder of the Selenga) are worked by a Russian company, which holds a monopoly of mining enterprise in the Tsetsen and Tushetu Khanates. Many of the valleys radiating from the Kentei range are auriferous, and some are evidently rich enough in gold to repay the attention of capitalists. I may mention here that, with the exception of gold-washings on the east slopes of the Southern Khingan, I neither saw nor heard of mineral products of any commercial importance until I reached the Kerulon.

A two-days' ride from the Terelchi gold-mines along the Kerulon—now a shallow stony stream of variable width, rapid and clear—through lone valleys, which are marshy in summer and frozen during the remainder of the year, brought me to the foot of the Kentei *massif*. This is the holiest of the many holy mountains in Mongolia. Thither every autumn the Manchu Amban comes from Urga, with a retinue of magnitude, to make oblation to the great nature-spirits, and Mongols and Chinese alike make pilgrimages from great distances to enlist their favour.

Our camping-place (4500 feet) was strewn with the remains of fires, mutton bones, skeletons of camels, felled logs, and broken carts, relics of the yearly visits of the Urga Amban. I rode up the mountain, through a thick forest of pine, larch, and cedar, to the *dalai* (ocean), the sacred lakelet on the south slope of Kentei. It is an irregular oblong, 1000 yards from east to west, by 300 to 400, and approximating 5600 feet above sea-level. Of course, the Mongol guide (a pleasant lama friend of Mr. von Grot) said that it was bottomless, but the water, though limpid, had not the dark azure of great depths. The shore is easily accessible on the east side; elsewhere the rocks rise steeply from the water's edge. Bleached driftwood cumbered this east beach, and a large *obo* was formed of it, before which our lama prayed long and earnestly and burnt a paper invocation. He also drank some of the water, which is credited with therapeutic qualities of supernatural origin. I have seldom felt the charm of a scene so much, and I noticed that both of my companions, the lama and a matter-of-fact Chinese soldier, were unusually silent and contemplative.

Next morning (September 21) we mounted to the summit of Kentei. At 7 a.m. in our camp the thermometer stood at 29°, but as we emerged on the exposed ridge above a strong nor'-wester drove it down to 17°, and the crests of the higher hills were veiled with snow. In half an hour we reached the main altar where the Amban worships. Before a large tree *obo*, festooned with prayer flags, there are rough tables of larch, with a boarding in front, on which the Amban kneels, and before this again there was a large earthenware cauldron full of *airak* (fermented mare's milk). Our lama stirred the *airak* with a pole, and produced from the depths remains of *hatakh* (scarf-offerings), walnuts, and tea-leaves. Close by the cauldron on the top of a small stone pile I noticed some clay masks, open-jawed, of conspicuously evil expression. The ground was covered with walnuts, cheese, *hatakh*, and Tibetan prayers written on calico and on paper. The lama prostrated himself thrice at full length before the *obo*, and added a rag to it; the Chinese guard contented himself with one prostration and an offering of a piece of bread, which he placed at the foot of the tree. On my return journey I disturbed a capercailzie who was feeding on the walnuts around this altar, and, secure in the prohibition against shooting on the sacred mountain, he perched on a branch close by and watched me take some photographs.

The summit (6600 feet) was reached without difficulty, except for the wind. The pilgrimages of centuries have marked recognizable paths, and Mongols ride the whole way up over tree-roots and fallen trunks. The slope was forested, but the broad uneven crest was blown bare of trees, and its surface was a mass of large loose stones of irregular shapes. When approaching the mountain, I observed from a distance of 6 miles a rounded *boss* on the summit which had been mentioned to me by Mr. von Grot. I clambered over this, and found it to be an oval tumulus, 250 yards long east and west, and 200 yards north and south, of the same loose stones which cover the mountain. I had no doubt that it was a human creation. There are two large stone *obo* on the crest of the tumulus, and on one of them there were the remains of a bronze censer. From a fragment of a Manchu inscription on this, which I copied, M. Dolbejev, of the Russian Consulate at Urga, read the date of the twelfth year of Chien-lung (A.D. 1748).

This is a remarkable tumulus, probably the largest in Mongolia. I am unable to believe that it is merely a prayer cairn, and it is a conjecture of Mr. von Grot, which I think is entitled to attention, that we have here the veritable tomb of Jinghis. Though we are informed that the body of Jinghis was borne secretly from the north of Shansi, where he died (A.D. 1227), into Mongolia, and that the guards killed every one they met "sur cette longue route," to prevent the news of his death spreading prematurely, there is no indication that the place of burial was kept a secret, and it is singular that it is not definitely known to Mongols. It is true that Potanin discovered in 1884, in the north-east corner of the Ordos country, a shrine composed of two felt tents and some wooden huts, which is said locally to mark the "remains" of Jinghis; but this appears to be a merely local belief at variance with all the earlier records. D'Ohsson, on the authority of Raschid (who wrote seventy or eighty years after the death of Jinghis), says that Jinghis was buried "sur l'une des montagnes qui forment la chaine du Bourcan-Caldoun, d'où sortent les fleuves Onan, Kéroulan, et Toula," and he concludes that "on peut admettre comme certain d'après le témoignage de Raschid, de Marco Polo et de Gaubil, que Tchinguiz-

Khan et plusieurs princes de sa dynastie furent enterrés près des sources de l'Onon et du Kéroulan." In a note to his translation of a portion of Raschid, Quatremère says, "Il me parait donc bien demontré que la montagne de Bourkhan-Kaldoun est identique avec celle que les Manchous appellent *Han-alin* (la montagne de Han ou de Kan) et que le P. Gerbillon désigne sous le nom de Kentey." Ssanang Setzen names the burial-place, "Yekeh Utek between the north slope of the Altai Khan and the south slope of the Kentei Khan," and in his description of the funeral mentions that the two-wheeled cart bearing the coffin stuck in the "blue clay soil" (this would point to the marshy valleys of the Upper Kerulon), and that a mound was raised over the grave.

A RECENTLY MUTILATED SACRIFICIAL STONE (TOMB OF KULTEGIN, ORKHON VALLEY).

The official Yüan history places the interment on Mount Kinien, north of the Gobi, which was also the sepulchre of Jinghis' successors. Gaubil remarks that the position of Mount Kinien is not stated exactly in this history, but he adds, "plusieurs seigneurs *Mongous* de la famille de Gentchiscan ont dit ici (Peking) que Gentchiscan est enterré sur la montagne de *Han*—Montagne *Han*, lat. 47° 54′, long. 9° 3′ occident."

To me it seems that Mount Kentei is indicated. The possible alternative is the Bogdo Ul closing the Urga valley on the south, still called Han-shan (Khan-ul, the Han Alin of D'Anville's map) by Chinese, on the crest of which there is also a tumulus of some dimensions.

I may remark here on the curious analogy between the Kentei Shan and Paik-tu San, the sacred mountain of North Korea. On the flanks of both three rivers take their rise—Tumen, Yalu, and Sungari on Paik-tu San; Onon, Kerulon, and Tola on Kentei—there are holy lakes near the summits of both, and both are revered officially. These official obeisances in the case of Kentei are performed on the slope of the mountain, but the Korean officials are content to worship their "ancestral mountain" from the first point of vision, which is probably 70 miles off.

TOMB OF TONYUKUK.

I returned rapidly to the Terelchi mines and Urga, and on September 27 visited, in company with Mr. Evstiféyev, a Russian friend who is well-versed in Siberian archæology, the tomb of Tonyukuk (Tonjukuk). It lies in a broad open valley called Bain Sukht, some 8 miles south of the Tola, and an easy day's ride, say 30 miles, south-east of Urga. When I reached this remarkable monument, which stands prominently on swelling ground 2 miles from the base of the higher hills, I could not help reflecting on the curious fact that two scientific expeditions, the Finnish of 1890, and the Russian of 1891 under Radlov, specially equipped for archæological researches, had spent some days at Urga, and a score of other scientific and inquiring travellers had passed within a few miles, without hearing of its existence. It is a striking illustration of the narrow circle within which information on any Mongol antiquity is obtainable, and should be an incentive to further leisurely and systematic search. Madame Klementz, the intrepid wife of the well-known Siberian archæologist, stumbled across it in her botanical excursions, and fortunately was alive to the importance of the old Turkish inscriptions covering two upright, rudely squared stones. These have been deciphered by Radlov, and the history of Tonyukuk, an old Turkish hero, who flourished in the seventh century, has been pieced together from Chinese sources by Prof. Hirth. I am only concerned here to mention that on September 28 of last year a hole had been dug recently in the tomb enclosure, and the brickwork, which evidently protects the sepulchre, exposed. For superstitious reasons, Mongols, as a rule, are the last persons to commit this sort of vandalism, and it was the impression of Mr. Evstiféyev and myself that foreign influence might be responsible in this instance. In any case, it is altogether desirable that some intelligent supervision of this almost unique monument should be instituted to put a stop to further demolition by unskilled and unscientific persons.

THE ORKHON VALLEY AND ERDENI TSU (KARAKORUM).

I spent the greater part of October in another rapid expedition to the Orkhon river and Erdeni-Tsu, in company with M. Evstiféyev.

The wide valley of this great affluent of the Selenga abounds in luxuriant pastures, the great attraction for nomads, and it is safe to conclude, from the many monuments and ruins which have been discovered of late years, that this favoured region was the centre of the old Turkish and Uigur dominions, as it was the headquarters of Ogotai and his immediate successors. Since Yadrintsev discovered, in 1885, the bilingual monuments (Chinese and old Turkish) in honour of the last great Turkish Khan, Mogilan, and his brother Kultegin, two scientific expeditions have examined this neighbourhood, and the results have been published by the Finno-Ugrian Society of Helsingfors, and by the Russian Imperial Academy of Sciences. The great finds, of course, were the long inscriptions in an unknown writing, of which some fragmentary specimens had been found in the Yenesei valley from the days of Messerschmidt. With the new material obtained from the tombs of Kultegin and Mogilan, Prof. Thomsen of Copenhagen, whose scholarly ingenuity in this matter has scarcely been noticed adequately, was able to supply the key which Radlov applied, and we now know the purport of these inscriptions. They confirm the national Turkish traditions which Raschid and Jowaini have handed down from lost Uigur books, that the valleys of the Orkhon and upper Selenga were the original home of the Turks.

I must sound a note of warning with regard to the tomb of Kultegin. The local Mongols received orders, in 1896 or 1897, from the Chinese Government to preserve the Chinese inscription (the Chinese inscription is on one side of the stone, and the Turkish on the reverse side), and when I visited the tomb on October 15 it was sheltered by a solid brick-and-tile structure of Chinese pattern. Unfortunately, the walls are built up to the sides of the memorial stone, the joints between it and the walls are cemented, and it is now impossible to examine the Turkish inscription, which, of course, must suffer in damp seasons by being boxed up in this fashion. It was especially irritating to see that the workmen sent to construct this shelter had obtained their basement course of grey granite by chiselling 2 feet off the side of an enormous sacrificial stone or plinth. I venture to invite the attention of Russian archæologists to this alarming treatment of one of the most interesting antiquities in Northern Asia.

The turning-point of my Orkhon journey was Erdeni-Tsu, which is marked on the old Jesuit maps as Erdeni Chao. Erdeni-Tsu was the first lamaistic shrine established in the Khalha Khanates, and, according to Mongol records which have been translated by Pozdnyéev, it was founded in 1586 in the city which had been the residence of Jinghis' son, Ogotai; that is to say, in the old Mongol capital, Karakorum. The existing monastery, which, if it is overshadowed politically by those of Urga, is still the most venerated of Mongolian holy places, is a collection of temples and shrines enclosed by a square of mud walls, 500 yards in the side and 15 feet high. It lies on the north slope of low bare hills, but westward the view is bounded by the forested ridges of the Khangai range. The walls, as usual, face the cardinal points; there is a large gate in the centre of each, and white dagobas (*sobergha*), built at intervals of 20 to 25 yards, take the place of bastions. There are a number of old monumental stones with inscriptions, which the Radlov Expedition examined, but I was most interested by the uneven space north and north-east of the monastery walls. There one finds an area of three-quarters of a square mile covered with irregular mounds, which attract notice at once as not being natural. Walking over this I observed pieces of tiles, broken bricks, and occasional lumps of granite, which showed traces of the chisel. At first I thought, seeing a number of refuse heaps scattered about, that these bricks and tiles might have been deposited in the course of the last three hundred years by the inhabitants of the monastery, but I had opportunities of assuring myself that they were really independent remains of old buildings. A portion of one of the mounds had been worn at the side by cart traffic, and another had been excavated recently; and in the exposed parts I saw bricks and tiles, whole and broken, embedded in the earth in a manner to banish all doubt. This area is the site of an ancient town which has been covered by aerial action, assisted by a yearly thatch of dwarf artemisia and grasses. At a mile and a half to the north of the monastery I struck a *balgas*, running east and west for 1200 paces, and north and south again for 800. Karakorum undoubtedly lay in this part of the Orkhon valley, and though Paderin was under the justifiable impression when, in 1873, he visited Khara-balgas, which is 20 miles north of Erdeni-Tsu and is now believed to have been the headquarters of an Uigur king, that he had found the site of Ogotai's capital, the evidence of the Erdenin Erikhe produced by Pozdnyéev, and the existence of the ruins I have roughly described above, make it more than probable that Erdeni-Tsu is the real site. If the Mongols could be won from their present rabid opposition to archæological delving, it might be possible to change this probability into a certainty.

My return journey to Urga, and eventually to Kiakhta (Troitskosavsk), Verkhne Udinsk, and the Great Siberian Railway, does not call for any observation in this paper.

MR. CAMPBELL'S MAP.—The map is constructed from a route survey by sub-surveyor Chabeh Singh, in conjunction with Mr. Campbell.

The CHAIRMAN (Colonel G. E. Church, Vice-President): Our paper this evening will be read by an old friend of the Society, who some twelve years ago appeared before us and read a paper on an interesting voyage which he made in Korea. Since that time his long residence in China has made him, perhaps, the best person possible for the explorations which he has made in Mongolia. I may say that he was with Sir E. Seymour in the attempt to relieve the Legations in Peking during the Boxer movement, and afterwards at Tientsin he was seriously wounded. He was for a long time a Chinese Secretary of Legation, so that his numerous qualifications for giving us an interesting paper scarcely need to be enlarged upon. I will call upon him, therefore, to take us with him this evening to Mongolia.

After the reading of the paper—

Colonel MANIFOLD said: I am afraid I can say very little on Mr. Campbell's most interesting paper, because I am not acquainted actually with Mongolia. It has now been recognized, I am glad to say, that particular attention must be paid to particular provinces, so that a man who has studied one province in China will probably know very little about a distant one. It so happens that I chiefly paid attention to provinces in the very opposite extreme—the provinces of the upper Yangtse, so I cannot say much about the paper beyond that I recognize what great value it must be to geographical research. Mr. Campbell has hardly laid enough stress on the admirable survey he carried out—a most accurate one. Lately, wherever exploration work has been carried on in China, a careful plane-table survey has been made, and such a survey is not only of interest to us from a geographical point of view, but also from the fact that China is one of the great places we have to look forward to for future trade as other countries get shut off, and there is no doubt but that a great development is likely to take place of British commercial interest, and all accurate survey that is carried out must invariably help to solve the problems which bear upon commerce. I had the pleasure of spending a year at Peking with Mr. Campbell just after the relief of the Legations, and I do not think it is recognized what tremendous geographical ardour Mr. Campbell must have had to carry him through his journey. During that year he was badly laid up, suffering from the effects of the wound he received when acting as one of the defenders of Tientsin—a siege which has not had nearly enough attention given to it. It was a very much more important siege than that of Peking, as the Chinese made a much more determined attack, and Mr. Campbell, in spite of the fact that he was suffering for a whole year from this wound, never allowed it to deter him from making this journey. In conclusion, I can only say I have listened with great pleasure to his paper, and I am sure his remarks are of the greatest value.

Mr. DELMAR MORGAN: I cannot add very much to what has already been so admirably told by Mr. Campbell of Mongolia. We are all, I feel sure, delighted to welcome him home after his long period of foreign service, during which he distinguished himself so greatly. Notwithstanding the illness and wound from which he suffered, he has succeeded in accomplishing a remarkable journey through a little-known part of Mongolia, and has communicated the results of his observations and investigations in the paper we have heard read this evening. Few travellers have visited the supposed site of Jinghiz Khan's capital, and those few mostly Russians. That conqueror founded an empire so vast that it comprised nearly the whole of Asia and extended to Eastern Europe, and in the words of the late Sir Henry Yule, writing of the times of the Venetian mediæval travellers, "In Asia and Eastern Europe, scarcely a dog might bark without Mongol leave." Jinghiz and his descendants founded the Yuan dynasty of China, and this country is to this day ruled by Manchu sovereigns of the same stock as the Mongols. Sir Henry Howorth has told us in his history of the princes and tribes of the Mongols, and he might have made some interesting remarks on Mr. Campbell's paper had he been here this evening, especially with reference to the discovery of the supposed burial-place of Jinghiz. The Khalkas are, as the lecturer told us, the finest specimens of the race, inhabiting the northern parts bordering on Russia, while to the south the Tsakhars, or Chakhars, have mixed with the Chinese and lost much of the Mongol type and character. Mongolia may yet play an important part in the future of Asia, owing to the facilities its vast plains afford to the construction of railroads converging on China. The Russians are making a special study of it, *e.g.* Pozdnéyef's great work referred to by Mr. Campbell, and it is hardly doubtful that in course of time they will open up communications through it as they have done in Western Turkestan and Manchuria. Nothing is more remarkable than the revolution they have brought about within the last twenty or thirty years by their conquests in Central Asia, and all geographers and travellers must feel grateful to them for the ease and security with which the most remote and formerly inaccessible regions can now be reached.

The CHAIRMAN: Perhaps the most interesting and fascinating regions of this Earth are the arid ones, and especially that great belt which extends from the Atlantic ocean through to the Pacific, crossing the Sahara, Arabia, Persia, and Central Asia, until we reach the great tableland Mongolia. The latter, I believe, is about 3000 feet above the sea, 1700 miles in length from east to west, and 1000 miles in width. Part of this area is occupied by the great desert of Gobi, 1200 miles long and about 500 miles wide. This central Asian plateau has given the world a great deal of history. The Mongolian race, tough, hardy, brought up in a climate where there are extremes of heat and cold, raising their flocks and herds, here to-day, there to-morrow, always restless, always war-like, always predatory, they have made their mark upon the history of the world perhaps as no other people have over so long a period, and therefore the paper to which we have listened this evening regarding Mongolia is of peculiar interest. I would like to call your attention to what it was that enabled these Mongolian and Central Asian tribes to make their wars and keep all humanity in turmoil. It was the horse. Mongolia is his native home, and from time immemorial he has been the link by which the tribes have sustained a rudimentary form of society. So long as he offered the fastest means of locomotion, so long as he enabled them to mobilize their forces and pour their hordes upon the sedentary races, so long they dominated the position; but when modern invention created means of better mobilization, when the railway came, when organized armies were formed, when modern methods of defence became known and gunpowder began to make havoc, the day of the nomad was done. He began to be tamed down, and for his taming perhaps the civilized world is more indebted to Russia than it is willing to acknowledge. And Russia, having put her hand to the plough, has dominated, as it were, all these wandering races, and probably cannot stop until the task is completed. Therefore it is that a remarkable comparison may be made between the pastoral and nomadic races and the sedentary ones. Up to the time the horse was the fastest means of moving armies, the pastoral and nomadic races were masters of the world. When they were dominant, they so threatened the Chinese Empire that the Chinese had to build the Great Wall about 220 B.C.; but four centuries afterwards a series of terrific onslaughts from the Mongolians conquered China and divided it into a northern and southern empire. Afterwards, in 1213, came Jinghiz Khan, that great conqueror of whom you have heard mention already. He victoriously stormed over the Great Wall with a vast army. Then followed Kublai Khan in 1260; he overran China and established the Yen dynasty, which lasted over a century. Later the Mongolians assisted the Manchus under Choun-Tchi, who in the latter half of the fourteenth century captured Peking and founded the dynasty which still rules the Flowery Land. But it is a curious fact that, while the nomad race has so often been the conqueror of China, China has always absorbed its conquerors. I think, as the hour is late, I will make no further remarks, but on your behalf I assume the honour of conveying to Mr. Campbell your cordial thanks for his lecture, and to those thanks I hope I may be permitted to add my own and my full appreciation of the knowledge which he has conveyed, and which has thrown light upon a very interesting region of this Earth's surface.

BATHYMETRICAL SURVEY OF THE FRESH-WATER LOCHS OF SCOTLAND.*

Under the Direction of Sir **JOHN MURRAY**, K.C.B., F.R.S., D.Sc., etc., and **LAURENCE PULLAR**, F.R.S.E.

INTRODUCTORY.

During the past season the survey of the Scottish fresh-water lochs has been continued with success. The bathymetrical survey of nearly all the principal lochs on the mainland, on the Orkneys, on the Shetlands, and on the Lews, has now been completed; the field-work for the present year was brought to a close towards the end of October. Next spring the field-work will be again resumed, and it is believed that, in the course of a few months, the remaining lochs of Scotland will have been surveyed—at least all the lochs exceeding half a mile in length, on which there are rowing-boats.

During the past summer a small yacht was permanently anchored in 300 feet of water in Loch Ness, and connected with the shore by means of an electric cable. On board the yacht three cables were fitted up with platinum resistance thermometers, which could be lowered to varying depths; the temperature at these depths could then be recorded on shore. The results show very remarkable changes of temperature, especially at depths of 200 and 250 feet, apparently depending on the direction of the wind blowing over the surface of the loch. At the same time temperature observations have been carried out on board a small steam-yacht with the ordinary reversing thermometers, all along the length of the lake.

A large number of other physical observations have also been carried on, and the biologists have been examining in great detail the bathymetrical distribution of organisms in Loch Ness and some adjacent lochs. These observations will be continued at Fort Augustus during the coming winter by members of the Lake Survey staff, and the results will be published at a later date.

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* Continued from p. 269. Maps, p. 600. Map I. shows Loch Tummel, the contour-lines of depth being drawn in at 25, 50, 75, 100, and 125 feet. Maps II. and III. show Loch Tay in two portions, the contour-lines of depth being drawn in at 50, 100, 200, 300, 400, and 500 feet. Map IV. shows Lochs Derculich, Scoly, Ordie, na Craige and Kennard, and Skiach, the contour-lines of depth being drawn in at 10, 25, and 50 feet. Map V. shows Lochs Broom, Essan, Lochan Breaclaich, Lochan na Lairige, Lochs Daimh and Giorra, the contour-lines of depth being drawn in at 5, 10, 25, 50, and 75 feet.

PART III.—LOCHS OF THE TAY BASIN.

The present communication deals with the lochs of the Tay basin, in continuation of the paper published in September last. The next paper, completing the account of the Tay basin lochs, will be published in January, and will be accompanied by a description of the geology of the region by Dr. John Horne, F.R.S., and Dr. B. N. Peach, F.R.S., including a geological map.

7. *Loch Tummel.*

Loch Tummel is situated amid beautiful scenery, rock, wood, and water being combined in such a way as to present pictures of rare loveliness, the crests of Farragon, Meall Tarruinn Chon, and Schiehallion rising to great heights to the south and south-west. It contains large trout and a great many pike. Loch Tummel is 2¾ miles in length, with a maximum breadth of half a mile, the mean breadth being a little over one-third of a mile, or 13 per cent. of the length. Its waters cover an area of 630 acres, or rather less than a square mile. It drains directly an area of 62½ square miles, but since it receives the outflow from Lochs Rannoch, Laidon, Bà, etc., its total drainage area is about 306 square miles, or 312 times the area of the loch. Nearly 300 soundings were taken in Loch Tummel, the maximum depth observed being 128 feet, or 4 feet more than the maximum depth recorded by Mr. Grant-Wilson, who took 123 soundings in 1888.

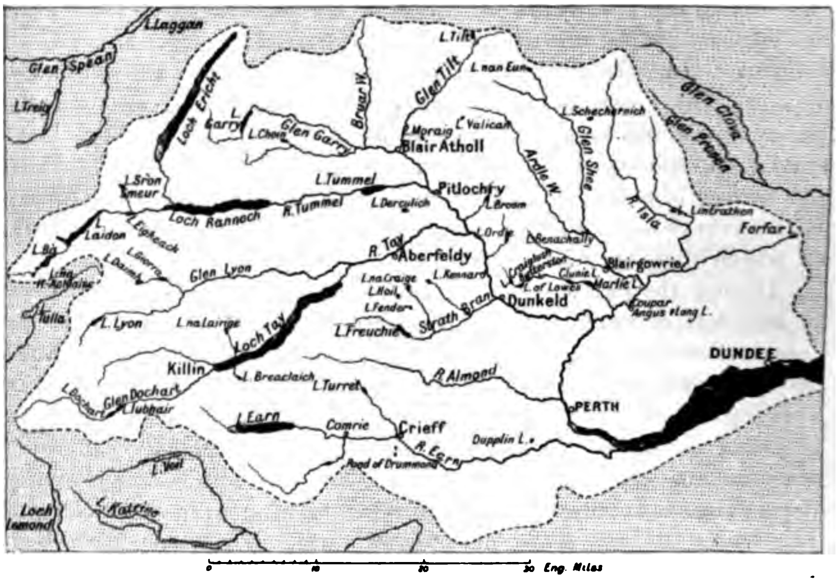

FIG. 1.—INDEX MAP OF THE TAY BASIN, BY J. G. BARTHOLOMEW, F.R.G.S.

The volume of water contained in the loch is estimated at 1,316,635,000 cubic feet, and the mean depth at 48 feet, or 37½ per cent. of the maximum depth. The length of the loch is 113 times the maximum depth, and 302 times the mean depth. The floor of Loch Tummel is irregular, falling into three deep basins separated by two ridges, the maximum depth on the westerly ridge being 52 feet, and the maximum depth on the easterly ridge being 56 feet. The deepest of the three basins is situated near the west end of the loch, the maximum depth of 128 feet occupying a central position in this basin, but a short distance to the south a sounding of 74 feet is recorded in close proximity to a sounding of 127 feet. The 100-feet contour-line in this western basin is almost circular and nearly one-third of a mile in diameter; about one-fifth of a mile to the east is an isolated sounding of 102 feet, surrounded by shallower water. The central 100-feet basin is oblong in outline, and nearly half a mile in length, the maximum depth of 119 feet having been observed towards the eastern end of the basin. The eastern basin just falls short of attaining a depth of 100 feet, the maximum observed being 99 feet; the 75-feet contour is approximately oblong in outline, and nearly one-third of a mile in length. The 50-feet basin is a continuous area stretching from about a quarter of a mile from the west end to within 100 yards from the east end of the loch, and is nearly 2½ miles in length.

FIG. 2.—LOCH TUMMEL.
(*Photo by J. Parsons, B.Sc.*)

The area of the lake-floor covered by less than 50 feet of water is about 352 acres, or 56 per cent. of the entire area of the loch; the area covered by water between 50 and 100 feet in depth is about 217 acres, or 34½ per cent.; and that covered by more than 100 feet of water is about 60 acres, or 9½ per cent. of the total area of the loch.

Loch Tummel was surveyed on April 23 and 24, 1902, by Dr. Johnston, Mr. Parsons, Mr. Clark, and Mr. M'Intosh, the level of the surface of the water being found, by levelling from Ordnance Survey bench-mark, to be 454·5 feet above the sea. When levelled by the surveyors of the Ordnance Survey on June 26, 1860, the surface of the water was found to be 453·3 feet above sea-level.

The temperature of the surface water of Loch Tummel at 1.30 p.m. on April 23, 1902, was 43° 2 Fahr. (the air-temperature at the time being 49°·2); at 9.45 a.m. on the next day (April 24) the surface temperature was 45°·0 (air-temperature 49°·0), and at 1 p.m. in the centre of the loch the surface temperature was 43°·5. A series of temperatures was taken below the surface at 1 p.m. on April 24, 1902, in 102 feet of water, with the following results:—

Surface	43°·5 Fahr.
5 feet	43°·5 „
10 „	43° 4 „
20 „	43°·2 „
50 „	43°·0 „
70 „	42°·6 „
100 „	42°·4 „

showing a gradual decrease of temperature from surface to bottom, the range of temperature being 1°·1 in the 100 feet of water.

About 3 miles to the south-west of Loch Tummel lies Loch Kinardochy,[*] a small hill loch containing pike, which flows into the river Tummel just before it enters Loch Tummel.

8. *Loch Tay.*

Loch Tay is one of the largest of the Scottish fresh-water lochs, unsurpassed in the beauty of its surroundings, and well known to anglers on account of its salmon fishings, which are among the best in Scotland. It is also a good trout-fishing loch, having been much improved within recent years by being stocked with Loch Leven trout. The scenery around the loch is very fine,—grand and wild towards the south-west end, with the mighty Ben Lawers rising from its northern shores about halfway down the loch, becoming more sylvan in character towards the north-east end, a splendid view presenting itself to the eyes of a spectator from Kenmore bridge (see Fig. 3).

Loch Tay is the largest loch in the basin of the river Tay, though

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[*] Loch of the end of the high field.

Loch Ericht is a very formidable rival for this distinction, as will be seen from the following comparison:—

	Loch Tay.	Loch Ericht.
Length	14·55 miles.	14·5 miles.
Maximum breadth ...	1·07 mile.	1·0 mile.
Mean breadth ...	0·70 mile.	0·5 mile.
Superficial area ...	10·19 square miles.	7·21 square miles.
Maximum depth ...	508 feet.	512 feet.
Mean depth	199·076 feet.	189·201 feet.
Volume of water ...	56,550 million cubic feet.	38,027 million cubic feet.

This comparison shows that the maximum depth observed in Loch Ericht slightly exceeds that observed in Loch Tay, but in all other respects Loch Tay has the advantage, though as regards length and maximum breadth the two lochs are almost identical.

Loch Tay is over 14½ miles in length, and over one mile in maximum breadth, the mean breadth being nearly three-quarters of a mile, or nearly 5 per cent. of the length. Its waters cover an area of over 6500 acres, or over 10 square miles, and it drains directly an area of about 187½ square miles, but since it receives the outflow from Lochs Dochart and Iubhair its total drainage area is over 232 square miles, or nearly 23 times the area of the loch. Nearly one thousand soundings were taken in Loch Tay, and the maximum depth observed was 508 feet. The maximum depth recorded by Mr. Grant-Wilson in 1888, when he took 415 soundings in Loch Tay, was 85 fathoms, or 510 feet. The volume of water contained in the loch is estimated at 56,549,745,000 cubic feet, or over one-third of a cubic mile, and the mean depth at 199 feet, or 39 per cent. of the maximum depth. The length of the loch is 15·1 times the maximum depth, and 386 times the mean depth.

Loch Tay trends in a north-east and south-west direction, being slightly sinuous in outline, somewhat like the italic letter *f*, as was noted in the case of Loch Iubhair, which flows into it. It is extremely simple in conformation, the bottom sloping gradually, without any pronounced irregularities, on all sides down to the deepest part, as is well shown on the longitudinal and cross sections on the map. The 50-feet basin approaches to within less than 400 feet from the south-west end, and less than 800 feet from the north-east end, and is 14⅓ miles in length. The slope of the bottom is thus steeper at the south-west end than at the north-east end. In the former position a sounding of 65 feet was taken about 750 feet from shore, giving a gradient of 1 in 11½, and in the latter position a sounding of 80 feet was taken about 1075 feet from shore, giving a gradient of 1 in 13½. The 100-feet basin extends from about a quarter of a mile from the south-west end to about one-third of a mile from the north-east end, and is very nearly 14 miles in length. The 200-feet basin stretches from about 1¼ miles from the north-east end to about 2⅕ miles from the south-west end, and is about 11 miles in length. The main 300-feet basin approaches to within less than 2 miles from the north-east end, and is over 7½ miles in length; it is separated, by a slight shoaling of the bottom over an interval of about a mile, from a small subsidiary 300-feet basin (based upon soundings of 301 and 305 feet), which is over half a mile in length. The 400-feet basin is over 3½ miles in length, lying in the northern half of the loch, and approaching to about 3½ miles from the north-east end. The deepest part of the loch lies between Skiag on the south-eastern shore and Cragganruar on the north-western shore, about 5½ miles from the north-east end of the loch, or about 6 miles by road from Kenmore, where there is a small basin over 500 feet in depth, two soundings of 508 feet being recorded about midway between the two shores.

FIG. 3.—LOCH TAY, FROM KENMORE BRIDGE.
(*Photo by T. N. Johnston, M.B., C.M.*)

The area of the lake-floor covered by less than 100 feet of water is estimated at about 1972 acres (over 3 square miles), or over 30 per cent. of the total area of the loch; the area between the 100-feet and 200-feet contour-lines is about 1532 acres (nearly 2½ square miles), or 23½ per cent.; the area between the 200-feet and 300-feet contours is about 1390 acres (over 2 square miles), or over 21 per cent.; the area between the 300-feet and 400-feet contours is about 1017 acres (over 1½ square miles), or 15½ per cent.; the area between the 400-feet and 500-feet contours is over 600 acres (rather less than 1 square mile), or over 9 per cent.; while the area covered by more than 500 feet of water is about 9 acres, or a small fraction of 1 per cent. of the entire area of the loch. These gradually decreasing areas between the contour-lines drawn in at intervals of 100 feet indicate that the average slope of the bottom becomes steeper and steeper on proceeding from the shore out into deep water; this is also clearly shown by a comparison of the two shallow zones on both sides of the 50-feet contour-line, the area between the shore and the 50-feet line being about 1161 acres, while the area between the 50-feet and 100-feet lines is about 811 acres, or respectively about 18 and 12½ per cent. of the total area of the loch. The slope of the bottom of the loch is shown on the natural scale and exaggerated five times on the longitudinal and cross sections on the map.

Loch Tay was surveyed on April 29 to May 7, 1902, by Sir John Murray, Dr. Johnston, Messrs. Parsons and James Murray, and the level of the surface of the water was determined by levelling from bench-marks as being 349·1 feet above the sea. The officers of the Ordnance Survey found the level to be 347·9 feet above the sea on August 12, 1899.

Many surface temperatures were taken during the progress of the survey from April 29 to May 7, 1902, the readings varying from 41°·8 Fahr. to 47°·5—a range of 5°·7. The higher readings, as a rule, were taken near shore, and the lower readings towards the centre of the loch over deep water. The air-temperatures taken during the same period varied from 42°·1 to 49°·1—a range of 7°. When visited on May 28, 1903, the surface temperature at noon about a mile from Kenmore was found to be 49°·3.

Two serial temperatures were taken beneath the surface in May, 1902, and one series in May, 1903, as given in the following table:—

SERIAL TEMPERATURES TAKEN IN LOCH TAY.

Depth (feet).	May 1, 1902. Off Ardeonaig.	May 6, 1902. Between Lawers and Fearnan, 4 p.m.	May 28, 1903. 1 mile west of Kenmore, noon.
	° Fahr.	° Fahr.	° Fahr.
0	43·8	42·0	49·3
3	—	—	47·0
5	43·2	42·0	44·5
10	43·2	41·9	44·0
20	42·0	41·9	—
25	—	—	43·1
30	41·9	41·8	—
50	41·7	41·8	42·9
100	41·2	41·7	42·5
150	41·0	—	—
200	40·8	41·2	—
250	40·5	—	—
300	40·3	41·0	—
350	—	41·0	—

It will be seen that on May 1, 1902, the temperature of the water down to 30 feet was higher than on May 6, 1902, while from 50 feet downwards it was lower. The range of temperature between the surface and a depth of 300 feet on May 1 was 3°·5 (from 40°·3 to 43°·8), while on May 6 it was only 1° (from 41° to 42°). On May 28, 1903, the temperature of the water was found to be considerably higher from the surface down to a depth of 100 feet than was observed in the previous May, the range of temperature in the upper 100 feet of water being 6°·8 (from 42°·5 to 49°·3).

9. *Some of the Smaller Lochs of the Tay Basin.*

*Loch Derculich.**—Loch Derculich, situated in Strathtay amid beautiful scenery, affords good fishing, but is strictly preserved; it flows by the Derculich burn into the river Tay to the north-east of Aberfeldy. It is surrounded by low rounded hills covered with heather, and there are few conspicuous boulders, but many small ones. To the north are high, steep hills (Farragon, etc.), with grey screes. The knoll forming the point at the boathouse on the south-eastern shore is high and planted with trees. The burn flows out of the loch by an artificial dam and sluice, which was open on the date of the survey, and the water in the loch was very low, a long gravelly point (not shown on the Ordnance Survey chart) appearing, and the island to the north was nearly, while the island to the south was quite, joined to the shore. Loch Derculich (pronounced Der'clich) is over half a mile in length from north to south, and also in maximum breadth from east to west, the mean breadth being over a quarter of a mile, or 45 per cent. of the length. Its waters cover an area of over 100 acres, or about one-sixth of a square mile, and it drains an area ten times greater—over 1½ square miles. About sixty soundings were taken, the maximum depth observed being 70 feet. The volume of water is estimated at 108,333,000 cubic feet, and the mean depth at nearly 25 feet, or 35 per cent. of the maximum depth. The length of the loch is 44 times the maximum depth and 126 times the mean depth. A ridge crosses the loch at the narrowest part near the middle, the greatest depth on which is 34 feet. On both sides of this ridge the water deepens, the maximum depth in the southern basin being 45 feet, while the main deep basin lies to the north of the ridge, the maximum depth of the loch (70 feet) having been found less than a quarter of a mile from the north-eastern angle of the loch, where there is a small 50-feet basin about one-tenth of a mile in length; a short distance to the north-east is an isolated sounding of 50 feet, comparatively close to the north-east shore, separated from the 50-feet basin by a sounding of 38 feet. The 25-feet basin is a continuous area half a mile in length and over a quarter of a mile in breadth. The area of the lake-floor covered by less than 25 feet of water is about 53½ acres; that covered by water between 25 and 50 feet in depth is about 44½ acres; while that covered by more than 50 feet of water is about 2½ acres. Loch Derculich was surveyed on May 27, 1903, by Mr. James Murray; the elevation above the sea could not be determined. A series of temperatures was taken in the deepest part of the loch at 8 p.m. on May 27, 1903, with the following results:—

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* = Loch of the great divers (the birds).

Surface	55°·0 Fahr.
10 feet	51°·0 „
15 „	49°·0 „
25 „	47°·7 „
50 „	47°·1 „
65 „	47°·0 „
70 „	47°·0 „

(the air-temperature at the time being 51°·0)

The range of temperature from surface to bottom was 8°·0, there being a fall of 4°·0 between the surface and a depth of 10 feet, and a further fall of 3°·3 between 10 and 25 feet. A comparison of these temperatures with those taken in Lochs Daimh and Giorra on the previous day shows that the water in Loch Derculich was much warmer from surface to bottom than in the two lochs referred to: at the surface the temperature was about 5°, and at 10 feet 3° to 4° higher; at the bottom it was 4° higher than at the bottom of Loch Daimh, and 1° higher than at the bottom of Loch Giorra at a much less depth.

A short distance to the south-west of Loch Derculich lies Loch Glassie,* a small hill loch containing pike, which also flows into the river Tay near the entrance of the Derculich burn. To the north-west of Loch Derculich lies Lochan a' Chait,† a little lochan which flows in the opposite direction into Loch Tummel.

Loch Scoly.—Loch Sooly, a small hill loch in Strathtay, lying to the north-east of Loch Kennard and west of Loch Skiach, and flowing by the Balnaguard burn into the river Tay shortly before its junction with the river Tummel, is over a quarter of a mile in length, with a maximum breadth of about one-eighth of a mile, the mean breadth being about one-sixteenth of a mile, or 21 per cent. of the length. Its waters cover an area of about 11¼ acres, and it drains an area 13 times greater, or about a quarter of a square mile. Twenty-five soundings were taken, the maximum depth observed being 12 feet. The volume of water is estimated at 2,888,000 cubic feet, and the mean depth at nearly 5¾ feet, or 48 per cent. of the maximum depth. The length of the loch is 123 times the maximum depth, and 258 times the mean depth. The loch forms a simple basin; the deeper water is found towards the southern end, the three soundings exceeding 10 feet being centrally placed in the southern half of the loch. Only three soundings were taken under 5 feet close to the shore, so that the slope of the bottom is on the whole moderately steep. The area of the lake-floor covered by less than 10 feet of water is over 10 acres, or 88 per cent. of the total area of the loch, and only a small proportion of this area is covered by less than 5 feet of water. Loch Scoly was surveyed on May 29, 1903, by Mr. James Murray. The temperature of the surface water was 63°·0 Fahr., and a reading at 5 feet gave the same result, while a reading at 10 feet gave 56°·0—a fall of 7°·0 in the temperature of the water at 10 feet as compared with that at 5 feet.

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* = Loch of the green meadows. † = Loch of the cat.

Loch Ordie.—Loch Ordie is a very pretty loch situated amid grouse-moors to the east of the river Tay, and surrounded by wooded hills; it is a good trouting loch, but strictly preserved. It receives the outflow from two little lochs lying among the hills to the north—Lochan Oisinneach Bheag* and Lochan Oisinnic Mhor†—and flows into the river Tay near Dalguise. It trends in an east and west direction, being widest towards the west end, and narrowing somewhat towards the east end. It is nearly two-thirds of a mile in length, and nearly half a mile in maximum breadth, the mean breadth being over a quarter of a mile, or 44 per cent. of the length. Its waters cover an area of about 116 acres, or nearly one-fifth of a square mile, and it drains an area nearly 24 times greater—over $4\frac{1}{4}$ square miles. Sixty-five soundings were taken, the maximum depth observed being 69 feet. The volume of water is estimated at 133,110,000 cubic feet, and the mean depth at $26\frac{1}{3}$ feet, or 38 per cent. of the maximum depth. The length of the loch is 49 times the maximum depth, and 128 times the mean depth. Loch Ordie is extremely simple in conformation, the bottom sinking gradually on all sides down to the greatest depth, which is approximately centrally placed, though rather nearer the west than the east end. The 25-feet basin is about two-fifths of a mile in length, and over a quarter of a mile in maximum width, while the 50-feet basin is about a quarter of a mile in length, and one-seventh of a mile in maximum width. The area of the lake-floor covered by less than 25 feet of water is about 66 acres, or 57 per cent. of the total area of the loch; that covered by water between 25 and 50 feet in depth is about 34 acres, or 29 per cent.; while that covered by over 50 feet of water is about 16 acres, or 14 per cent. of the entire area of the loch. Loch Ordie was surveyed on June 3, 1903, by Mr. James Murray, and the level of the surface of the water was determined by levelling from bench-mark as being 946·3 feet above the sea. Serial temperatures taken in the deepest part of the loch gave the following results:—

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* = The little cornered loch (*i.e.* having bays or nooks).

† = The big cornered loch (*i.e.* having bays or nooks).

Surface	57°·6 Fahr.
10 feet	55°·3 „
15 „	49°·5 „
25 „	47°·1 „
50 „	45°·7 „
68 „	45°·4 „

The range of temperature from surface to bottom was 12°·2, there being a fall of 5°·8 between 10 and 15 feet.

Loch na Craige.[*]—Loch na Craige (or na-Craig), one of the best trout lochs in the district, is situated in Strathtay about 3 miles to the south-east of Aberfeldy, and flows into the river Bran by the Cochill burn, which also receives the outflow from Loch Hoil. It is surrounded by low, heather-clad hills covered with stony *debris.* It is nearly half a mile in length, nearly one-eighth of a mile in maximum breadth, the mean breadth being about one-twelfth of a mile, or 16 per cent. of the length. The waters of the loch cover an area of about 24 acres, and it drains an area fourteen times greater, or more than half a square mile. Nearly thirty soundings were taken, the maximum depth observed being 13 feet. The volume of water is estimated at 7,871,000 cubic feet, and the mean depth at nearly 7¼ feet, or 57 per cent. of the maximum depth. The length of the loch is 195 times the maximum depth, and 342 times the mean depth. Loch na Craige is a long, narrow depression trending in a north-west and south-east direction, or nearly north and south. It forms a simple basin, the deep water running along the centre of the loch, the area covered by more than 10 feet of water being over one-third of a mile in length, but it is rather curious to note that the maximum depth of 13 feet was found at the extreme southern end of the 10-feet basin and comparatively very close to the southern shore. The slope of the bottom is thus pretty steep here, and in other places the slope is steep; for instance, two soundings of 11 feet were taken about 60 feet from shore, one off the western and one off the eastern shore, giving a slope of 1 in 5·5. About 63 per cent. of the lake-floor, or about 15¼ acres, is covered by less than 10 feet of water. Loch na Craige was surveyed on May 29, 1903, by Mr. James Murray, who determined the elevation of the surface of the water by levelling from bench-mark as being 1297·3 above the sea. Temperatures were taken in the deepest part of the loch, with the following results :—

Surface	60°·0 Fahr.
5 feet	60°·0 „
10 „	56°·5 „

(the air-temperature at the time being 63°·0)

Loch Kennard.[†]—Loch Kennard, a good fishing loch abounding with small trout, is situated in Strathtay, and flows into the river Bran by the Ballinloan burn. Its shores are nearly all wooded, and where not planted with trees the low hills are covered with heather. It is peculiar in outline, somewhat resembling that of a young mushroom, the stem pointing west and the apex of the crown pointing north-west. It is over two-thirds of a mile in length, and over one-third of a mile in maximum breadth, the mean breadth being over one-sixth of a mile, or 26 per cent. of the length. Its waters cover an area of about 77 acres, or nearly one-eighth of a square mile, and it drains an area seven times greater, or nearly nine-tenths of a square mile. Nearly fifty soundings were taken, the maximum depth observed being 72 feet. The volume of water is estimated at 108,439,000 cubic feet, and the mean depth at 32¼ feet, or 45 per cent. of the maximum depth. The length of the loch is 50 times the maximum depth and 111 times the mean depth. Loch Kennard forms a simple basin, with here and there minor undulations of the bottom. The deepest water (72 feet) is found in the centre of the widest part of the loch, to the east of the constriction in its outline; in the middle of this constriction a depth of 70 feet was found, but immediately to the west the bottom rises to 50 feet beneath the surface, and falls again farther west to a depth of 63 feet. The 25-feet basin is half a mile in length and over a quarter of a mile in maximum width, while the 50-feet basin is over one-third of a mile in length. The area of the lake-floor covered by less than 25 feet of water is nearly 30 acres, or 38 per cent. of the entire area of the loch; that covered by water between 25 and 50 feet in depth is about 33 acres, or 43 per cent.; while that covered by more than 50 feet of water is over 14 acres, or 19 per cent. of the total area of the loch. These figures show that the average slope is steeper between the shore and the 25-feet contour-line than between the 25-feet and 50-feet contours. Loch Kennard was surveyed on May 29, 1903, by Mr. James Murray, who was unable to determine the elevation of the surface of the water above the sea. Temperatures were taken in the deepest part of the loch, with the following results:—

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[*] = Loch of the rock.

[†] Loch of the high point.

Surface	56°·7 Fahr.
5 feet	51°·0 „
10 „	48°·3 „
25 „	46°·0 „
50 „	45°·5 „
72 „	45°·3 „

(the air-temperature at the time being 60°·0)

The range in the temperature of the water from surface to bottom was thus 11°·4, the fall of temperature between the surface and a depth of 5 feet amounting to 5°·7, that between 5 and 10 feet amounting to 2°·7, and that between 10 and 25 feet to 2°·3. A comparison of these temperatures with those taken in Loch Derculich two days previously shows that the temperature of the whole body of water in Loch Kennard was lower than that in Loch Derculich (except at the surface—which may be due to the fact that the observations in Loch Kennard were made in the early afternoon, while those in Loch Derculich were taken in the late evening).

*Loch Skiach.**—Loch Skiach, situated in Strathtay, containing large trout as well as pike, flows into Little Loch Skiach (which was not sounded) by a short burn with a slight fall, and thence by the Pitleoch burn into the Ballinloan burn shortly before it joins the river Bran. It is surrounded by low rounded, heather-clad hills with scattered boulders, and the shores are of clean shingle with boulders. It is very irregular in outline, the longer axis being nearly north and south, and the bottom is also irregular. It is over three-quarters of a mile in length, and nearly half a mile in maximum breadth, the mean breadth being nearly one-fifth of a mile, or 25 per cent. of the length. Its waters cover an area of about 98 acres, or over one-seventh of a square mile, and it drains an area six times greater—an area of nearly one square mile. Eighty-five soundings were taken in Loch Skiach, the maximum depth observed being 55 feet. The volume of water is estimated at 77,185,000 cubic feet, and the mean depth at 18 feet, or 33 per cent. of the maximum depth. The length of the loch is 75 times the maximum depth, and 228 times the mean depth. Near the middle a ridge crosses the loch from south-east to north-west, on which the depth is less than 20 feet; this ridge separates the two deep basins, of which the southerly one is the deeper, the maximum depth of 55 feet having been recorded about a quarter of a mile from the southern end of the loch, while the greatest depth recorded in the northern basin was 45 feet in two places. The two 25-feet basins are each under a quarter of a mile in length. Near the middle of the loch the slope of the bottom is very steep in places; for instance, a sounding of 33 feet was taken off the eastern shore at a distance of about 100 feet, giving a slope of 1 in 3, and a sounding of 26 feet about the same distance off the western shore gives a slope of 1 in 3·8. The area of the lake-floor covered by less than 25 feet of water is about 77 acres, or 79 per cent. of the total area of the loch; that covered by water between 25 and 50 feet in depth is about 20 acres, or 20 per cent.; while that covered by more than 50 feet of water is only about 1¼ acres, or 1 per cent. Loch Skiach was surveyed on June 12, 1903, by Mr. James Murray, and the level of the surface of the water was determined by levelling from bench-mark as being 1385·7 feet above the sea. The temperature of the surface water on commencing the survey at 9 a.m. on June 12, 1903, was 59°·0 Fahr. (the air-temperature at the time being 53°·0). Later in the day serial temperatures were taken in the deepest part of the loch, with the following results :—

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* = Loch of thorns.

Surface	60·0° Fahr.
10 feet	59·0° ,,
15 ,,	55·3° ,,
20 ,,	49·2° ,,
30 ,,	49·0° ,,
45 ,,	48·0° ,,
55 ,,	47·5° ,,

The range in the temperature of the water from surface to bottom was thus 12°·5; between the surface and a depth of 10 feet the fall was only 1°, but between the depths of 10 and 20 feet the fall of temperature amounted to nearly 10°,—3°·7 between 10 and 15 feet, and 6°·1 between 15 and 20 feet. These readings are all higher than those taken in Lochs Kennard and Derculich about a fortnight earlier in the season.

Loch Broom.—Loch Broom, a fine trout loch, but strictly preserved, lies to the east of the river Tummel, into which it flows by the Lochbroom burn to the north of Ballinluig, before the river Tummel joins the river Tay. It is nearly three-quarters of a mile in length, and over one-third of a mile in maximum breadth, the mean breadth being nearly one-fifth of a mile. Its waters cover an area of about 86 acres, or over one-eighth of a square mile, and it drains an area of 3½ square miles—an area twenty-six times greater than the area of the loch. Over sixty soundings were taken in Loch Broom, the maximum depth observed being 9 feet. The volume of water contained in the loch is estimated at 18,813,000 cubic feet, and the mean depth at 5 feet, or 56 per cent. of the maximum depth. The length of the loch is 422 times the maximum depth, and 757 times the mean depth.

Loch Broom is very shallow, being simply a large bog-hole, or depression in the moorland, with shores of yellow sandy *débris* covered by peat, and all heather-clad. The outflow is over a dam about 5 feet high, so that the greater part of the loch must be artificial. Where the depth is less than 5 feet the bog-bean is everywhere seen, and there are numerous islets—some of peat, others chiefly of bog-bean—on several of which gulls nest. The deeper water (over 5 feet) lies to the east and north of the islets, the maximum depth of 9 feet having been observed in several places towards the eastern shore; along the western shore and around the islets the bottom is covered by less than 5 feet of water, but at the outflow, where the waters of the loch pass into Lochbroom burn, two soundings of 5 feet were taken. The area of the lake-floor covered by less than 5 feet of water is about 38 acres, or 44 per cent. of the entire area of the loch, while that covered by more than 5 feet of water is about 48 acres, or 56 per cent. Loch Broom was surveyed on June 11, 1903, by Mr. James Murray, but the elevation above the sea could not be determined. Drift-marks were observed 3 feet above the level of the water on the date surveyed.

The temperature of the surface water on commencing the survey at noon on June 11, 1903, was 60°·0 Fahr., and two readings in open water —one at the surface and one at a depth of 8 feet—gave in each case 60°·8 (the air-temperature being 51°).

*Loch Essan.**—Loch Easan (or Easàin), a hill loch lying to the north of Loch Dochart, containing dark-coloured trout of rare quality, but strictly preserved, flows by the Allt Essan into the river Dochart after it leaves Loch Iubhair. It is nearly half a mile in length, and over one-fifth of a mile in maximum breadth, the mean breadth being about one-ninth of a mile. Its waters cover an area of about 32 acres, and it drains an area of over 1½ square miles—an area thirty-two times greater than the area of the loch. Over forty soundings were taken in Loch Essan, the maximum depth observed being 18 feet. The volume of water is estimated at 9,664,000 cubic feet, and the mean depth at nearly 7 feet, or 38 per cent. of the maximum depth. The length of the loch is 135 times the maximum depth, and 356 times the mean depth. The loch trends in an east and west direction, and is very irregular in outline. The bottom is also irregular, forming three small basins with depths exceeding 10 feet, the westernmost being the deepest, the maximum depth of 18 feet having been observed about one-sixth of a mile from the west end of the loch. To the east of this western deep basin, and near the centre of the loch, lies a heap of stones around which soundings of 6 feet were taken. A little farther to the east lies the central 10-feet basin, based on a sounding of 11 feet. To the east of the central basin there is a constriction in the outline of the loch in which soundings of 7 and 8 feet were taken, and on approaching the east end the loch widens out, and the bottom sinks to form the third (eastern) 10-feet basin, the maximum depth in which is 16 feet. To the south of this eastern basin is a small island, the passage between the island and the shore being obstructed by weeds, and weeds are also abundant along the northern shore. The area of the lake-floor covered by less than 10 feet of water is about 26 acres, or 81 per cent. of the total area of the loch, while that covered by more than 10 feet of water is about 6 acres, or 19 per cent. Loch Essan was surveyed on June 16, 1903, by Mr. James Murray, who estimated the elevation of the surface of the water as being about 1440 feet above sea-level.

About half a mile to the south-west of Loch Essan lies the little Loch Maragan, which flows by the Allt Inverhaggernie in the river Fillan before it enters Loch Dochart.

Lochan Breaclaich.†—Lochan Breaclaich (or Loch-an-Breacklaich), a hill loch containing fine trout, flows into Loch Tay near its south-west end by the Allt na Breaclaich. It is peculiar in outline, somewhat resembling the capital letter Y, a promontory of land projecting into the loch from the eastern shore opposite the inlet on the western shore which leads to the outflow. The length of the loch from north-east to south-west in a straight line is about half a mile, but a line following the axis of deep water would be considerably over half a mile in length. The maximum breadth is about one-third of a mile, and the mean breadth about one-seventh of a mile. Its waters cover an area of about 43 acres, and it drains an area twenty times greater, or about $1\frac{1}{3}$ square miles. About sixty soundings were taken in Lochan Breaclaich, the maximum depth observed being 41 feet. The volume of water is estimated at 26,619,000 cubic feet, and the mean depth at 14 feet, or 34 per cent. of the maximum depth. The length of the loch is 64 times the maximum depth, and 187 times the mean depth. The bottom of the loch is fairly regular, sinking, to the north and south of the promontory referred to, into two basins with depths exceeding 25 feet, occupying the arms, as it were, of the letter Y, while the shank of the letter, leading to the outflow, is occupied by shallower water. Of the two deep basins the northern one is the larger and deeper, the maximum depth of 41 feet having been found approximately in the centre of this basin, but towards the north-western shore, while the southern basin is based upon soundings of 32 and 26 feet. The 10-feet basin is a continuous area extending from close to the north-eastern end to near the south-western end, and occupying the greater portion of the loch. The area of the lake-floor covered by less than 10 feet of water is over 19 acres, or 45 per cent. of the total area of the loch, while that covered by more than 10 feet of water is nearly 24 acres, or 55 per cent. Lochan Breaclaich was surveyed on June 16, 1903, by Mr. James Murray, but the elevation of its surface above the sea could not be determined.

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* = Loch of the waterfalls. † = Speckled loch.

The temperature of the surface water on commencing the survey at 2 p.m. on June 16, 1903, was 57°·0 Fahr. (the air-temperature being 58°·0). Serial temperatures taken in the deepest part of the loch gave the following results:—

Surface	57°·5 Fahr.
5 feet	57°·5 „
10 „	57°·4 „
15 „	51°·2 „
20 „	49°·3 „
40 „	48°·0 „

It will be observed that the range of temperature from surface to bottom amounted to 9°·5, and that the fall of temperature between the depths of 10 and 15 feet amounted to 6°·2.

*Lochan na Lairige.**—Lochan na Lairige lies to the west of Ben Lawers, and flows into Loch Tay by the Allt a' Mhoirneas, which enters the loch nearly opposite the entrance of the Allt na Breaclaich. It trends in a north and south direction, and is extremely simple in outline and conformation; it is oblong in outline, and of nearly uniform width throughout. It is nearly three-quarters of a mile in length, and over one-eighth of a mile in maximum breadth, the mean breadth being one-tenth of a mile, or 14 per cent. of the length. Its waters cover an area of about 47½ acres, and it drains an area 16 times greater, or about $1\frac{1}{6}$ square miles. Over forty soundings were taken, the maximum depth observed being 39 feet. The volume of water is estimated at 22,682,000 cubic feet, and the mean depth at 11 feet, or 28 per cent. of the maximum depth. The length of the loch is 99 times the maximum depth, and 350 times the mean depth. The northern portion of the loch is shallow, the water deepening gradually on proceeding southwards until the maximum depth is encountered about one-eighth of a mile from the southern end; thence the water shallows rapidly towards the south end. The 10-feet basin is about half a mile in length, extending from near the south end to within one-sixth of a mile from the north end. The 25-feet basin is contained in the southern half of the loch, and is about a quarter of a mile in length. The area of the lake-floor covered by less than 10 feet of water is over 29 acres, or 62 per cent. of the entire area of the loch, while that covered by more than 10 feet of water is over 18 acres, or 38 per cent., of which 8 per cent. exceeds 25 feet in depth. Lochan na Lairige was surveyed on June 16, 1903, by Mr. James Murray, who estimated that the surface of the water was about 1595 feet above the level of the sea.

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* = Loch of the homestead.

To the north-east of Lochan na Lairige lies the little Lochan a' Chait[*] on the eastern flanks of Ben Lawers; it flows into Loch Tay by the Lawers burn.

Lochs Daimh and Giorra, situated in the wilds of Glenlyon, amid grand and mountainous scenery, are good trouting lochs, but strictly preserved. Loch Daimh flows into Loch Giorra by a short river, and the outflow from both lochs is carried into the river Lyon by the Allt Conait. To the south, on the flanks of Stuchd an Lochain, lies the small (Lochan nan Cat [*]), at an elevation of over 2000 feet above the sea, which flows into the river between Lochs Daimh and Giorra. It being reported that this little lochan was frozen over a few days before the date of the survey of Lochs Daimh and Giorra, it was visited in the hope of taking soundings through holes in the ice, but the ice had disappeared. It was apparently shallow all round the shore, except where there are screes from the cliffs, and, if at all deep, it must be over a very limited area. The temperature of the water was 53°·0 Fahr. (the air-temperature being 55°·0), while a reading taken close under the crags beside the snow gave 49°·8. Lochs Daimh, Giorra, and nan Cat are sometimes referred to as the Lochs of Roro.

Loch Daimh.[†]—Loch Daimh (or Damh) trends in an east and west direction, being widest and deepest towards the west end, narrowing and shallowing towards the east end. It is nearly a mile in length, and nearly one-third of a mile in maximum breadth, the mean breadth being nearly one-fifth of a mile, or 19 per cent. of the length. Its waters cover an area of about 111 acres, or over one-sixth of a square mile, and it drains an area nearly 30 times greater, or over 5 square miles. Nearly sixty soundings were taken, the maximum depth observed being 95 feet. The volume of water is estimated at 189,623,000 cubic feet, and the mean depth at 39 feet, or 41 per cent. of the maximum depth. The length of the loch is 53 times the maximum depth and 130 times the mean depth. The loch is of simple conformation, and, on the whole, comparatively deep, only half a dozen soundings under 10 feet being recorded close to the shore. Off the northern shore, towards the west end, the slope of the bottom is very steep, soundings of 31 feet and 44 feet having been taken about 80 and 100 feet from shore respectively; this is equal to a slope of 1 in 2·3 to 2·6. The eastern end, and south-eastern portion of the loch around the island, are comparatively shallow. The 25-feet basin is about three-quarters of a mile in length, stretching from quite close to the west end to within one-sixth of a mile from the east end. The 50-feet basin is nearly half a mile in length, and the 75-feet basin, occupying the western half of the loch, is over one-third of a mile in length. The maximum depth of 95 feet was observed in two places approximately near the centre of the wide western portion of the loch. The area of the lake-floor covered by less than 25 feet of water is about 50½ acres, or over 45 per cent. of the total area of the loch; that covered by water between 25 and 50 feet in depth is about 21½ acres, or over 19 per cent.; that covered by water between 50 and 75 feet in depth is about 19 acres, or 17 per cent.; and that covered by more than 75 feet of water is about 20½ acres, or over 18 per cent. of the entire area of the loch. The flat-bottomed character of the deep western portion of the loch is well brought out by a comparison of the last two percentages, while the high percentage of the bottom covered by less than 25 feet of water is due to the comparatively large shallow area in the south-eastern and eastern part of the loch.

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[*] = Loch of the cat.

[†] = Loch of the stags.

Loch Daimh was surveyed on May 26, 1903, by Mr. James Murray, but the level of the surface of the water above the sea could not be determined. The temperature of the surface water on commencing the survey at 9.30 a.m. on May 26, 1903, was 51°·0 Fahr. (the air-temperature being 64°·0), and a series of temperatures taken in the deepest part of the loch gave the following results:—

Surface	50°·3 Fahr.
10 feet	47°·0 ,,
25 ,, ...	44°·0 ,,
50 ,, ...	43°·5 ,,
90 ,, ...	43°·0 ,,

The range in the temperature of the water from surface to bottom was thus 7°·3. The fall of temperature from the surface to a depth of 10 feet amounted to 3°·3, and that between the depths of 10 and 25 feet amounted to 3°·0, and below 25 feet the fall amounted to 1°·0.

*Loch Giorra.**—Loch Giorra (or Girre) trends almost east and west; there is a slight bend near the middle of the loch, the eastern half trending north-west and south-east. It is over four-fifths of a mile in length, with a maximum breadth of over a quarter of a mile, the mean breadth being about one-sixth of a mile, or 20 per cent. of the length. Its waters cover an area of about 88½ acres, or less than one-seventh of a square mile, and it drains directly an area of over 5½ square miles, but, since it receives the outflow from Loch Daimh, its total drainage area is over 10¾ square miles—an area 78 times greater than the area of the loch. Nearly sixty soundings were taken in Loch Giorra, the maximum depth observed being 49 feet. The volume of water is estimated at 83,686,000 cubic feet, and the mean depth at nearly 22 feet, or 44 per cent. of the maximum depth. The length of the loch is 88 times the maximum depth, and 200 times the mean depth.

The floor of Loch Giorra is rather irregular. The deepest part is in the western half, the maximum depth of 49 feet having been observed about one-sixth of a mile from the west end. The 25-feet basin in this part of the loch is about two-fifths of a mile in length, and towards the east end there is a second 25-feet basin about one-fifth of a mile in length, in which the maximum depth is 40 feet. These two basins are separated by a remarkable rise of the bottom, on which depths of 15 and 18 feet were recorded, surrounded on all sides by deeper water. The area of the lake-floor covered by less than 20 feet of water is nearly 43 acres, or over 48 per cent. of the total area of the loch; that covered by water between 20 and 40 feet in depth is nearly 38 acres, or about 42½ per cent.; while that covered by more than 40 feet of water is over 8 acres, or over 9 per cent. Loch Giorra was surveyed on the same day as Loch Daimh, May 26, 1903, by Mr. James Murray; its elevation above the sea could not be determined. A series of temperatures taken in the deepest part of the loch gave the following results :—

Surface	50°·0 Fahr.
10 feet	48°·0 „
25 „	46°·8 „
45 „	46°·0 „

(the air-temperature at the time being 53°·0)

A comparison of these temperatures with those taken in Loch Daimh later in the day shows that, while the surface temperature in each loch was nearly identical, the temperature of the water beneath the surface was lower in the deeper loch : thus at 10 feet the temperature in Loch

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* = Short loch (shorter of two).

SUMMARY TABLE.

Giving Details concerning the Lochs described in this Paper.

Loch.	Height above sea. Feet.	Number of soundings.	Length in miles.	Breadth in miles.		Mean breadth per cent. of length.	Depth.			Ratio of depth to length.		Volume in million cubic feet.	Area in square miles.	Drainage area.	
				Max.	Mean.		Max. feet.	Mean feet.	Mean per cent. of max.	Max.	Mean.			Total in square miles.	Ratio to area of loch.
Tummel	454·5	289	2·75	0·50	0·36	13·1	128	48·030	37·5	113	302	1,317	0·98	306·06	312·31
Tay	349·1	924	14·55	1·07	0·70	4·8	508	199·076	39·2	151	386	56,550	10·19	232·06	22·77
Derculich	—	59	0·59	0·59	0·27	45·1	70	24·717	35·3	44	126	108	0·16	1·57	10·00
Scoly	—	25	0·28	0·12	0·06	21·4	12	5·724	47·7	128	258	3	0·02	0·23	12·77
Ordie	946·3	65	6·64	0·48	0·28	43·8	69	26·324	38·2	49	128	183	0·18	4·28	23·64
Na Craige	1297·3	27	0·48	0·13	0·08	16·5	13	7·420	57·1	195	342	8	0·04	0·54	14·21
Kennard	—	47	0·68	0·36	0·18	26·2	72	32·266	44·8	50	111	108	0·12	0·88	7·27
Skiach	1385·7	85	0·78	0·44	0·20	25·1	55	18·090	32·9	75	228	77	0·15	0·94	6·14
Broom	—	62	0·72	0·34	0·19	26·0	9	5·020	55·8	422	757	19	0·13	3·53	26·34
Essan	1440·0	41	0·46	0·21	0·11	23·7	18	6·820	37·9	135	356	10	0·05	1·60	32·00
Lochan Breaclaich ...	—	59	0·49	0·33	0·14	28·2	41	14·088	34·4	64	187	27	0·07	1·35	19·85
Lochan na Lairige ...	1595·0	43	0·73	0·13	0·10	13·7	39	10·970	28·1	99	351	23	0·07	1·16	15·67
Daimh	—	56	0·96	0·31	0·18	18·8	95	39·117	41·2	53	130	190	0·17	5·13	29·48
Giorra	—	55	0·82	0·26	0·17	20·5	49	21·701	44·3	88	200	84	0·14	10·78	78·10
		1838										58,657	12·47	568·72*	45·60

* It must be remembered that the drainage area of Loch Tay includes the areas draining into Lochan Breaclaich and Lochan na Lairige, and that the Loch Giorra drainage area includes that of Loch Daimh.

Daimh was 1°·0 lower than in Loch Giorra, at 25 feet it was 2°·8 lower, and at 50 feet it was 2°·5 lower than at 45 feet in Loch Giorra.

The particulars regarding the different lochs dealt with in this paper are collected together in the table on p. 540 for convenience of reference and comparison.

From this table it will be seen that in the fourteen lochs under consideration 1838 soundings were taken, and that the aggregate area of the water surface is about 12½ square miles, so that the average number of soundings per square mile of surface is 147. The aggregate volume of water contained in the lochs is estimated at about 58,657 millions of cubic feet. The area drained by these lochs is about 568¾ square miles, or nearly 46 times the area of the lochs.

DR. AND MRS. WORKMAN IN THE HIMALAYAS.*

Dr. William Hunter Workman and Mrs. Fanny Bullock Workman made another expedition to the Karakoram Himalayas during the past summer. The latter part of June they explored the Hoh Lumba glacier lying west of the Hispar glacier to its sources. As in case of the Choga Lungma, they found the course of this glacier quite different from that laid down on the Indian Trigonometrical Survey map. At about the middle point of its length, the glacier divides into two branches of similar size and length separated by a high mountain wall. The map shows the westerly of these to run through to join the Hispar glacier. In reality it ends in a snow col 18,600 feet high, surmounted by a tremendous cornice overhanging a precipice 6000 to 7000 feet sheer on the north-east side. An inaccessible icefall leads from the glacier to the col. Dr. and Mrs. Workman and guides ascended this col by the only available route. They crossed a large Bergschrund and traversed a succession of ice-slopes of 60° incline lying on the shoulder of a mountain just above a high precipice, which could only be passed by those thoroughly equipped for mountain work. Directly beneath the col runs a narrow glacier converging upon the Hispar glacier, which it probably joins west of the Zong La, although the junction could not be seen from the col. The other branch, called the Sosbon, ends in a similar col of about the same height, with cornice and precipice falling to the same narrow glacier. The approach to this up a rather steep slope directly from the glacier is easier than to the other col except for the soft snow, which near the top was waist-high. A high mountain ridge separates the narrow glacier from the Hispar. The whole Hoh Lumba glacier, as well as all the mountain flanks, was covered deeply with snow left by the storms of the severe and late winter, and all camps had to be made in the soft snow, which concealed ice, moraine, and rock from sight. With the exception of two days, the weather was stormy. A large branch glacier runs west from the Hoh Lumba near its end, terminating in three smaller branches, and opposite a small branch runs south-east; a small branch also runs west from the point of bifurcation of the Hoh Lumba. There are no other branches, the glacier being fed by hanging glaciers on the sides of its enclosing mountains, which are marvellously beautiful in form and impressive in size.

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* Communicated by Dr. Hunter Workman.

In July the party again ascended the Chogo Lungma to the base camp of 1902, at 14000 feet on a rock promontory projecting into the glacier at the junction with it of the Haramosh glacier. Here they were detained by storms till the first week in August. The last week of July, during a lull in the stormy weather, they explored the upper branch of the Chogo Lungma, which, leaving it about 3 miles from its origin, runs west-south-west for about 12 miles. This glacier, which is as large as the Haramosh, breaks into the Chogo Lungma in a series of icefalls and seracs. Above these are high snowfields with large crevasses, which are swept by avalanches from the mountains on both sides, making the passage of the glacier dangerous. The snowfields ascend to a snow col 19,000 feet high, beyond which the valleys slope away towards Gilgit. The snow was soft and deep, and snow-shoes were used with advantage. The snow, which froze during the night, softened under the burning sun by 9 o'clock a.m., so that the coolies sank in knee-deep, and camps had to be made by 10 o'clock, which made progress slow.

In August the weather improved. Dr. and Mrs. Workman immediately started with Mummery tents and light camp outfit to attempt the ascent of one or more of three high snow-peaks crowning a boundary wall of the Chogo Lungma. The first camp was made on a side glacier in snow at the base of the slopes of the first peak at a height of 16,200 feet. The second was on a small snow plateau at a height of 18,600 feet. From here an attempt was made to establish a third camp at a height of over 20,000 feet, so that the highest of the three peaks measured by the Indian Survey at 24,486 feet might be attacked with a chance of success, but many of the coolies, who can always be depended on to fail at important crises, were prostrated by mountain sickness, and the third camp had to be pitched at the base of the first and lowest peak at 19,355 feet, and the final ascents carried out from here. At 3 o'clock a.m., with a temperature of 15° Fahr., by the light of a waning moon, Dr. and Mrs. Workman, two guides, and a porter started to ascend the first peak. The snow-slopes were so sharp (60° to 70°) that the entire ascent had to be made in zigzags and by traversing. At 7 a.m. the summit, a snow-cornice 21,770 feet, was reached. Here readings of hypsometer, barometer, and thermometer were taken, after which a descent of several hundred feet was made to a snow arête leading to the second peak. This was traversed, and the ascent of the second peak was accomplished in soft snow ankle-deep. Its top, 22,567 feet, was gained at 10 a.m.

The party had now performed seven hours of fatiguing work at a high altitude, and it was manifestly impossible to reach the summit of the third peak (24,486 feet) on that day. To scale this, a high camp would have to be made on the plateau leading to it at 22,000 feet, which with coolies would be an impossibility, and, if possible, would be a hazardous experiment in the variable climate of this region. The sharp peak loomed up ahead above the ascending plateau. Upon its south-west arête was a point nearly a thousand feet higher, which evidently commanded a view towards Nagar, which it was desirable to obtain. Mrs. Bullock Workman and the porter remained on the second summit, whilst Dr. Workman and the two guides descended to the plateau, crossed it, and after a stiff scramble up the steep slants of the peak, reached the desired point on the arête at 12.30 p.m. Calculations based on the hypsometric and barometric readings here taken, and those taken at the same hour of the Government mercurial barometer at Skardo (average of calculations by three different tables), place the height attained at 23,394 feet, 311 feet higher than the summit of Aconcagua.

The view from here, as from the two lower peaks, was indescribably grand. Among the countless thousands of spires, wedges, and corners on every side, rose to the south-east the giant peaks of the Biafo, the Mustagh Tower, Masherbrum, Gusherbrum, and the sharp pyramid of K_2, nearly destitute of snow, towering far above all surrounding peaks and ridges. On the south, Haramosh and the immense mass of Nanga Parbat formed a fitting background to other beautiful and majestic mountains more to the front. Directly beneath lay the Chogo Lungma, with its winding moraines visible throughout nearly its whole length; also its last 12-mile branch leading straight away to its snowy col, beyond which valleys stretch towards Gilgit. From the Pertab Singh La, at the head of the Chogo Lungma, a large glacier falls away between massive mountains into a valley which runs directly towards Nagar. Opposite, on the other side of the Chogo Lungma, stands a beautiful snow-needle, measured by the Indian Survey at 22,810 feet, upon whose summit the party could look down. Camp was reached at 6 p.m. The next morning the barometers had fallen; clouds were rising on the horizon. A retreat to the base camp was made, but the storm burst before it was reached. The whole five days' work was done on ice and snow.

From the Chogo Lungma the Balucho Nulla, a side valley, was explored, the lower half of which is covered with large rough moraines, left by the dying and receding glacier. A large glacier still dominates the upper half. Near its head a snow pass 17,000 feet high, leading over to the Kero Lungma, was discovered and crossed. A cornice had to be cut through, and the descent made by a snow wall of 70° 1000 feet high, gullied by avalanches.

The Hulcho Alchori glacier, the largest branch of the Kero Lungma, was next explored to its sources. This glacier is also wrongly defined on the survey map. Its course is more to the north than the map shows, and at its upper end it divides into three branches running about north-north-east, north, and north-north-west respectively. The glacier proper follows the north-north-east branch. This ends in an icefall, up which a passage could be found at one point only. Above this is a steep col of rock and snow, 18,200 feet high, from which an inaccessible precipice falls almost upon the Hispar glacier. Passages to the Hispar were sought throughout this region, but only at four points were cols found that could be scaled from the south-west side, and the descent from all these towards the Hispar is by precipices. The Mushik La appears to be the only practicable passage to Nagar from this region. The branches of the Hispar on the north are much longer and less steep than from the south.

The expedition was accompanied by the guides J. Petigax and C. Savoie, who accompanied the Duke of Abruzzi on his polar expedition, and porter L. Petigax, all of Courmayeur; also by Mr. B. Hewett, of London, as surveyor. Hypsometric, barometric, and thermometric readings were taken at all points, and readings were also taken three times daily by the official in charge of the Government station at Skardo for the determination of heights. Readings were also taken with solar thermometer. Above 13,000 feet the temperature of the sun's rays was found to average considerably higher than in the torrid Indian plain. Readings at an altitude of over 17,000 feet were obtained as high as 204° Fahr. Measurements were made by Mr. Hewett to determine distances, heights, and movement of glaciers. Many photographs were secured.

GEOGRAPHY AT THE BRITISH ASSOCIATION MEETING AT SOUTHPORT.

UNDER the energetic command of Captain Creak, the work of the Geographical Section was carried out with much precision and heartiness. The captain's own address was the only one which surveyed the World as a whole, and he directed our attention to the subtle magnetic properties with which he is so familiar. In this presidential address he showed how important the Antarctic expeditions were in securing reliable magnetic observations which would have a great practical as well as theoretic value.

The account of the National Antarctic Expedition was given by Lieut. Shackleton, and the main facts have already appeared in the *Geographical Journal*. This gives no idea of the vivid and racy description of the life of the explorers with which the gallant lieutenant delighted a large audience. Equally effective were Dr. Tempest Anderson's descriptions and views of St. Vincent and Martinique, and of the volcanic activity and destruction of which they have been the theatres. The gist of his communication is published in the March number of the *Geographical Journal*. Lieut.-Colonel Manifold took us across China, from Yunnan to Peking down the Yangtse and back across the land-route farther to the north through Sechwan. His paper, in an extended form, will at a later date be published in the *Geographical Journal*. Dr. H. O. Forbes read a report on his expedition to Sokotra, the results of which are now being published by the Liverpool Museum. Mr. Lomas, who has been working at some of the material brought back by Prof. Herdman from Ceylon, described the physical features of Adam's Bridge. Dr. J. P. Thompson was unfortunately prevented from being present, but his paper, dealing with all aspects of the geography of Queensland, was read by the recorder.

The only African paper was that by Mr. E. D. Morel on the "Economic Development of West Africa." He pointed out that there are urgent reasons why a manufacturing nation like ours should show keener interest in one of the greatest raw material producing countries in the world, of which we possess some 700,000 square miles, inhabited by 30,000,000 people. The extent of British commercial interests in West Africa was commonly ignored, and the future potentialities of the country insufficiently appreciated. The chief factor which determined the Powers to assume the liabilities they have incurred in tropical Africa was the belief that raw material was necessary to an industrial and manufacturing nation, and that each nation must find new markets for the consumption of home manufactures, markets which would pay for such manufactures in raw material. The economic development of tropical Africa was therefore the principal aim which each Power had in view. How could that economic development be best pursued in a manner profitable to the people of Europe and to the people of Africa? If it was to be permanently successful it must be profitable to both.

He pointed out that two antagonistic plans were before the world, which might be defined as Coercion and Commerce. The former he characterized as a revival in an aggravated form of the old culture system of the Dutch East Indies, which had to be abandoned owing to the ruin and exhaustion it brought with it. It was at present in operation in a large portion of tropical Africa. It tended towards the enslavement of whole peoples, and brought inevitable ruin in its train. He argued that, apart from its moral side, this conception was antagonistic to the development of all legitimate European aims in tropical Africa, and was practically short sighted and injurious.

The other conception had, notwithstanding many material obstacles, produced results which were already obvious and visible to all. It was based upon the recognition that the inherent rights of a native of tropical Africa to his land and the produce thereof were the necessary accompaniments of all successful and permanent development work in the interests both of the European and the Negro. The commercial instincts of the Negro were notorious, and his adaptability remarkable. The theory that he will not work was untenable in face of the positive results of his labours in the millions of pounds' worth of produce shipped home annually to Europe from West Africa. He merely required instruction and guidance to prevent wastage and destruction of economic products due to want of knowledge in the preparation and collection of the raw material. An urgent necessity was the careful study of native land tenure as an important factor in economic development, the theory of "vacant" lands being often misleading and open to grave abuses. Mr. Morel then discussed the best means of improving native industries and helping the native to construct new ones, laying particular stress upon the great importance of extending the growth of cotton in, and promoting its export from, the tropical African provinces of the Empire. Reference was made to various measures which might with advantage be taken by Government to secure these ends, and the opinion was expressed that the only right and practical idea which should govern European action in tropical Africa (which was, and must always remain, a black man's country, where the European could not colonize and could only supervise) was to teach the native to take pride in his property; to guarantee him from molestation in his ownership of his property; to assist him in developing the raw products his fertile soil yielded for his own advantage and ours; to make it clear to him that we looked upon him, not as a fool, still less as a brute, but as a partner in a great undertaking which, if properly conducted, would confer lasting benefit upon his race and the white over-lords who have established themselves in his midst.

The scientific and economic value of botanical surveys based on the distribution of plant associations is gradually being recognized, and it is to be hoped that the work already done in this country by the pupils of Prof. Geddes and others will lead to a systematic survey, not only of the British Isles, but of our colonies. Agricultural wealth is of more permanent value than mineral wealth, and a botanical survey of many parts of the empire should take precedence even of a geological one, if, as ought to be the case, topographical, geological, and botanical surveys are not practically simultaneous.

Dr. Otto Darbishire, of the Owens College, discussed the relation and importance of botany to geography. Plants play a very important part in the composition of the scenery of our Earth. So much is this the case that a barren desert strikes us as remarkable, chiefly on account of the absence of any vegetation. The professional geographer and traveller has generally at most only a very slight acquaintance with any branch of botany. The problem before us is, Would an acquaintance with certain branches of botany be of any scientific interest or practical value to the geographer? Botany and geography meet on common ground in the following branches of botany :—(*a*) The geographical distribution of plant species. The distribution of plants when grouped according to their natural affinities into natural orders, genera, or species is seen to depend very generally on the distribution of temperature over the Earth's surface, without reference, as a rule, to local conditions. (*b*) The geographical distribution of plant forms, or ecology. The plant form is an expression of the way in which the plant body has adapted itself directly to the external conditions under which the plant is living. It affords, therefore, to a certain extent, an indication of what these conditions are. An association of similar plant forms is called a formation. The presence of any of the three chief kinds of formation, namely, forest land, grass land, and desert land, depends almost entirely on the relation existing between the supply of water available for absorption by the plant root and the amount of water given off by the plant shoot. The preponderating influence may be due to the climate (climatic formation) or the soil (edaphic formation). Temperature generally has no hand in the making of the plant form. (*c*) The influence of the plant world on the Earth's surface. Most sub-aërial plants penetrate into the soil for purposes of attachment or absorption of food material. Their action may be a physical one only, or a chemical one in addition. Plants are as often responsible for the first crumbling away of the solid rock as for the binding together of loose soil. These three subjects are of great interest to the geographer, but ecology is, in addition, of the greatest importance to the traveller. Ecology teaches the traveller how to analyze and classify the forms of vegetation met with. He is enabled through it to make out many of the prevailing conditions by reference to the plant forms observed. He is also enabled to give a scientifically accurate account of what he has seen, because he understands the relation existing between the plants and the conditions under which they are living. A knowledge of ecology should, in fact, be considered a most necessary part of the scientific equipment of any professional traveller.

Dr. W. G. Smith, of Yorkshire College, with whose beautiful maps readers of the *Geographical Journal* are already familiar, discussed the value of observation of features of vegetation in geographical exploration. He pointed out that descriptions or even notes on vegetation were not a feature in the majority of papers in English relating to travel and exploration. Yet the vegetation of a country was, after the configuration, the most important factor in the landscape. Considerable progress had been made towards representing the vegetation of a country on maps. This was done by recording the limits of distribution of the most abundant (or dominant) plants, such as trees, and already the vegetation of considerable tracts of Britain, Europe, and North America had been charted. The detail in simple cases showed the region of deciduous trees as distinct from that of coniferous trees, and the forest lands as contrasted with treeless. Or greater detail might be shown, as in the series of maps now being issued in Britain. Vegetation charts of all parts of the Earth would be a distinct gain to plant geography. The scope of such a survey for any area would depend on the maps available and on the observer's knowledge of plants. In the case of a party which included a botanist and traversed a country with fairly complete maps, there should be considerable opportunity of ascertaining and recording the limits of important dominant plants. Such a survey, accompanied by the collecting of plants, would furnish material of great value. In the case of an expedition in an area poorly charted there would still be opportunities of collecting fragmentary evidence regarding vegetation. Notes on the dominant plants could be made at places where geographical observations were taken, and where a change occurred from one type of vegetation to another the limit could be ascertained with as much accuracy as possible. Even in a case where the dominant plants were unknown to the observer, a small collection of them labelled by numbers for reference could be afterwards identified. An acquaintance with the methods of botanical survey followed in Britain and elsewhere would be a useful preliminary for intending travellers.

Mr. Francis J. Lewis, F.L.S., University College, Liverpool, described the work he has done since 1900 in making a botanical survey of the basins of the Eden, Tees, Tyne, and Wear. The results will be published in the *Journal*.

A further contribution on this subject was that on "Peat Moors of the Southern Pennines: their Age and Origin," by Mr. C. E. Moss, B.SC. The author classified them as (i.) Cotton-grass Moors, (ii.) Heather Moors, and (iii.) Grassy Moors. The question as to whether or not the Pennines were prehistorically tree-clad was discussed, and evidence of (i.) history, (ii.) place-names, (iii.) buried timber, (iv.) neolithic flints, and (v.) present range of British forest trees, was considered, and the conclusion arrived at that, though the Pennine slopes were tree-clad so late as Saxon and Danish times, yet at that period the summits were covered with an extensive morass. This morass was caused by the destruction or decay of forests which existed on the Pennine summits so late probably as the Roman period. In order to check the estimate suggested by the above conclusions, the mode and rate of formation of peat were considered. The author discussed (i formation and (ii.) the slow formation of peat, and (iii.) the plants which form peat at the present time; and he considered that, as a rule, the peat moors of the Pennines cannot date to a period further back than about two thousand years. The paper concluded with remarks on the possible utilization of the Pennine peat moors.

Of immediate local interest was the paper on "Sand-dunes," by Dr. Otto Darbishire, read at the Botanical Section, which was supplemented by an excursion. A practical application of botanical geography was illustrated by the paper of Mr. Parry, engineer-in-chief of the Liverpool waterworks, on the afforestation of waterworks catchment areas, with special reference to the case of Liverpool. This paper, unfortunately, was read in the afternoon, but though there was a comparatively small audience, it gave rise to a most animated and practical discussion. Mr. Parry showed the advantages likely to arise from the afforestation of waterworks catchment areas. He said the authorities of many large towns, such as Manchester, Liverpool, and Birmingham, and of many smaller towns, had been led to the conclusion that the purity of their water-supplies could be effectually secured only by their becoming the owners of the watersheds, and Parliament had readily granted the necessary powers. On the question how these areas were to be utilized, Mr. Parry said that, in order to reduce to a minimum the risks of polluting the water in a manner likely to produce disease, the first object must be to limit the resident population to the lowest number reasonably practicable, and this could not be done if agricultural operations were allowed to be carried on in the ordinary way. For a large proportion of these areas timber-growing might justly claim to be the most profitable use to which the land could be applied; whilst the effect of trees upon the yield and quality of the water collected could not be otherwise than beneficial. Mr. Parry then explained what had been done in the way of afforestation by the Liverpool Corporation at their Vyrnwy watershed in North Wales.

Three communications related to physical geography. Prof. Pettersson, of Stockholm, discussed the influence of ice-melting upon oceanic circulation, and showed an experiment of Mr. J. W. Sandström illustrating the effect of melting ice on the movement of salt water. Prof. Pettersson's paper will be published in the *Journal.*

Dr. Vaughan Cornish presented the report of the committee on terrestrial surface waves, and showed a number of exceptionally clear and beautiful views of waves, more particularly in the Niagara falls and rapids.

Mr. Heawood made the only communication on the history of geography in his paper on "Henricus Glareanus (sixteenth-century geographer) and his Recently Discovered Maps," which will be separately published in the *Journal.*

The needs of modern surveyors was discussed by Mr. E. A. Reeves, in a paper entitled "Notes and Suggestions on Geographical Surveying suited to Present Requirements," which will be separately published in the *Journal.*

Mr. G. James Morrison afterwards discussed the map projections suited to general purposes.

A joint meeting of the Geography and Education sections was held to discuss geographical education, and is separately repeated.

GEOGRAPHICAL EDUCATION AT THE BRITISH ASSOCIATION.

A JOINT meeting of the Geography and Education Sections of the British Association was held under the presidency of Sir William Abney and Captain Creak during the recent meeting at Southport, to discuss the subject of geographical education. At a time when our educational systems are being closely examined, and when great administrative changes have just been effected, it is most important that the educational value of geography should be recognized by educational authorities, and that it should be used to bind together the at present largely unco-ordinated subjects of which teachers complain they have too many. The organizing committees of the two sections are to be congratulated on arranging the discussion, which was opened by Mr. Mackinder in an address characterized by its broad outlook and wide sympathy. The following abstract presents the salient points of the address: *—

Classics and mathematics are effective educational disciplines largely because, as the result of long experience, they can be taught by methods which are progressive from the lower to the higher forms of a school. If geography is to be generally utilized in secondary education it must become similarly *progressive* rather than merely cumulative of facts. In practice this implies the fulfilment of three conditions—

(1) That the pupils be classed in special "sets" for geography, lest they omit stages in the argument;

(2) that the master know the subject thoroughly; and

(3) that the public examinations be based on some generally accepted sequence of exposition, as in the case of languages and mathematics.

It would probably be hopeless to expect a general fulfilment of the first two conditions unless the third be practicable. It is well, therefore, to concentrate attention upon this.

The phenomena of geography are capable of arrangement upon alternative principles, either according to regions or according to categories. In the one case the chapter-headings of a text-book would be such as "France," "India," etc.; in the other they would be such as "volcanoes," "climates," etc. The former is spoken of as regional geography, the latter as general, or commonly, but unfortunately, as physical geography. In the university the general classification may often be advisable, but in the school it is submitted that the *regional* basis should in the main be adhered to, for distribution is of the essence of geography, and imparts to regional geography a unity not possessed by physical geography. Indeed, the latter might be described as a series of chapters treating of the geographical aspects of other sciences—astronomy, geology, meteorology, botany, zoology, anthropology, strategy, economics, and history. The separation of school geography into two subjects, topography and physical geography, has probably done more than anything else to arrest its development as a discipline.

It is suggested that it would be quite possible to weave into the regional treatment so much as is needed of other sciences by taking these in *one at a time* in the successive stages of the strictly geographical argument. This idea will be most easily conveyed by sketching a possible course of instruction. Let it be divided into six stages, of which the first will be elementary, the next four secondary, and the last higher.

STAGE 1 (elementary).—It is agreed on all hands that the teaching of geography should commence with the home. This, however, involves, among other things, the observation of the apparent movements of the sun and stars, and hence their explanation by means of the globe. The lie and names of the continents and oceans would also be learnt upon the globe, and some idea of their chief contrasts won from the reading of simple stories of discovery, adventure, and travel, the teacher everywhere asking the pupil to contrast with the home conditions.*

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* A full report of this discussion is published in the *Geographical Teacher* for October.

STAGE 2 (ages thirteen and fourteen).—This, which is usually omitted, should have for subject such a wider "home area" as would permit of the study of entire river-basins, water-partings, coast and hill forms, etc. The real study of the use of maps as opposed to mere plans and sketch-maps would commence here, and this would be the approximate stage for the introduction of such ideas as the deposition, folding, faulting, and sculpture of rock strata as explanatory of the surface forms.

STAGE 3 (ages fourteen and fifteen).—Here the "home country," the British Isles, would be considered as a whole. The land-forms and essentials of structure would be quickly yet accurately conveyed by the use of the ideas and terms learnt in Stage 2, and time would thus be available for a thorough explanation of the climatic contrast; a subject unsuited to Stage 2 by reason of the limitation of the area then studied. Moreover, the teaching of elementary physics by the science master would at about this stage render the fundamental ideas involved more easily appreciable.

STAGE 4 (ages fifteen and sixteen).—Here we come to the comparison of the home country with the great civilized countries of Europe. The physical facts, both morphological and climatic, would be conveyed quickly yet accurately by means of the ideas and terms learnt in Stages 2 and 3, and special stress would now be given to the political and economical facts. The pupils would be ready for these by reason both of their progress in history and of their increasing interest in the newspapers. Care would be taken to correlate the political with the physical. Problems and essays would be set.

STAGE 5 (ages sixteen and seventeen).—This would be devoted to the study of the whole globe, especially outside Europe. It might include more accurate astronomical ideas (*cf.* Stage 1), for which the pupils would have become fitted by reason of their mathematical studies; also the leading facts conditioning plant-life. Both of these contributions would be pertinent to the treatment of climates. The history of discovery (*cf.* Stage 1) would be utilized in explaining the chief place-names. The pupils would by this time have accumulated a considerable background of knowledge which would be appealed to. The increasing wealth and variety of the data would necessitate firm grip on principles and a logical method. Therefore a specialist teacher would be advisable in order to obtain mental discipline, just as a classical sixth form requires a composition master.

STAGE 6 (university and college).—Here we should naturally find both deeper intension and wider extension. By the adoption in part of the general classification—*i.e.* by the study of the distribution of particular types of phenomena—the student would become critical and be prepared for original research. On the other hand, by the complementary effort to construct a harmonious regional geography out of a great series of varied data, he would be inspired with a broad and philosophical outlook.

Nowhere is the contrast between the general and the regional method more conspicuous than in the treatment of the wind system. The temptation is great to commence deductively from an imaginary landless globe. But this is essentially unsound, because it implants wrong and unscientific habits of thought. The trade winds, for instance, should first be learnt of and *realized as a great fact* in the description of the North Atlantic, the complementary wind being added in the description of the South Atlantic. The double system would then be found again in the Pacific, and a generalization demanded by the pupil which would presently be limited by the facts of the Indian ocean. The Sahara desert would carry the generalization a step further and into apparently different phenomena. Only in the end would deduction from ideal zones or belts of climate be permitted by way of mental stocktaking.

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* In the case of children not proceeding to secondary schools, selected portions of Stages 2 and 3 must be taken in the latter part of the elementary training.

The criticism of the practical teacher for such a scheme as is here outlined would probably be grounded on limitations of time. It is submitted that with the pupils in geographical sets, specialist teachers, and agreement as to examination bases, very much might be accomplished even with the hours now usually available. At the risk, however, of appearing visionary, it is further submitted that those hours should be extended on the ground that geography is one of six elements needed in any liberal as opposed to technical education. These elements are—

(1) Language, with reading and writing as its implements, and the mother, the foreign, and the dead tongues as its varieties.

(2) Mathematics, or training in abstract thought.

(3) Experimental science, or training in thought about concrete things.

(4) History, or outlook through the time covered by human records.

(5) Geography, or outlook through the space accessible to men.

(6) Religion and philosophy.

It is submitted that the inclusion of these six elements in a general education is more essential than the study of several varieties of any one, *e.g.* several languages or several sciences.

Apart, however, from any such theoretical argument, it is claimed that geographical teaching, if it deals with real conceptions and not merely names, trains in the mind a distinct power, that of thinking in terms of the map, of visualizing intricate correlations, of ordering complex masses of fact—a power of the utmost value in the practical affairs of after-life. Geography rightly taught should tend to correct the academic bias of linguistic and mathematical study, the specialist bias of scientific study, and the archaic or sentimental bias of historical study. Its danger lies obviously in superficial knowledge and uncritical thought. Taught in the past too often by those who knew little of it, geography has no doubt deserved its inferior position among educational disciplines.

Finally, it is submitted that geography can be placed in its rightful position only by the simultaneous application of a four-fold policy—

(1) The encouragement of university schools of geography where geographers shall be made, of whom many will become secondary teachers.

(2) The appointment of trained geographers as teachers in our secondary schools, either for geography alone or for geography and general help in other subjects.

(3) The general acceptance of a progression of method in the subject, not expressed in detailed syllabuses issued by the State or other dominant authority, which would tend to stereotype teaching, but in a tradition similar to that which at different times has governed the teaching of language and mathematics.

(4) The setting of examinations by expert geographical teachers.

It is obvious that these four measures must be applied simultaneously, for schools will not appoint specialist teachers unless there is a supply of them to select from; and yet a supply will not be forthcoming unless there be a promise of posts, nor is the teacher independent of the examiner or yet of the general esteem of his subject based on a belief in the value of its methods.

An Ounce of Fact.—The adoption of a new syllabus for geography in the London Matriculation and of geography as an obligatory subject in the Intermediate Examination of the Faculty of Economics and Commerce, coupled with the appointment of a holder of the diploma of the Oxford School of Geography as teacher of the subject at University College School, London, has contributed to results which are patent in the Pass List issued last month by the London University.

Captain WILSON-BARKER said that pupils should be encouraged to draw their own maps, and to fill them in; their attention should be directed to prevailing meteorological, geological, and biological features in different countries, and the influence of these on existing conditions should be traced. Pains should be taken to stimulate the student's interest and arrest his attention.

Mr. HUGH RICHARDSON, of York, gave a most inspiring account of his own experience of what could be done in a boarding school with boys from thirteen to seventeen years of age. He described lessons based on the 1-inch Ordnance sheets; experiments carried on in the laboratory, on which books gave little help, such as an investigation into the nature and properties of sand; and the value of using literature in teaching science. His contrast of the scientific description "8 p.m. cirrus" with Ruskin's "the whole heaven one scarlet canopy tossing vault beyond vault as with the drifted wings of many companies of angels" was most effective, and his insistence on the importance of neglecting neither most convincing.

Mr. CLOUDESLEY BRERETON, Inspector of Schools in Ireland, drew a dark picture of still-existing ways of teaching geography. He pointed out that even with the limited time at our disposal, we could improve matters a good deal if we began by making jettison of much of the lumber which encumbered our geographies to-day, and weaving into a logical and systematic treatment the bays, islands, rivers, etc., of the country to be studied, with configuration and climate taken as its basis. Even if all these ideas were carried into practice, there were still three main difficulties with which the teaching of the subject would have to be content—the lack of adequate preparation in the pupils on their entrance into the secondary schools, the lack of really qualified teachers, and the lack of touch between the examiners and the schools.

Mr. G. FLETCHER considered that physical and not regional geography should be the foundation of geographical teaching.

Mr. J. L. HOLLAND, of the Assistant Masters' Association, thought that Mr. Fletcher had not quite understood what regional geography was, and had confused it with the old lists of place-names which did duty for it in antiquated text-books.

Mrs. HERBERTSON dealt with the objection that young children could not understand a map, and pointed out that such a graphic method of recording natural features as an Ordnance map was in harmony with a child's natural tendency to represent a road by straight lines, a wood by little trees, a house by a little square. She thought that intelligent children of eight or nine readily learned to read a map, and that if allowed access to different kinds of maps—physical maps, vegetation maps, climate maps, etc.—they puzzled out for themselves a great deal of information which it would be laborious to memorize verbally.

Mr. SCOTSON, of the Central School, Manchester, said what was required was that the teacher should have freedom and be able to carry out his own methods. Inspectors had very different ideas as to the course the teacher should pursue in teaching many subjects, especially geography. Some endeavoured to force the teachers to adopt their plans; if teachers did not agree with their suggestions, they were likely to suffer. Worse still: these inspectors were constantly changing; so the teacher was asked to change his course of instruction, and adopt a plan which he did not think a good one. This was his personal experience at the present moment. A teacher who thought out a plan for himself and believed in it, was much more likely to teach the subject with enthusiasm, and with good results. Enthusiasm in a teacher spread to his pupils, and the pupils became interested; their intelligence was awakened, and the whole lesson became a pleasure to teacher and taught. Therefore he asked for freedom for the teacher.

Prof. R. A. **Gregory** considered that the reason why the many otherwise excellent syllabuses drawn up by societies interested in the study of geography had had so little effect was that the schemes suggested were not practicable under the ordinary conditions of school-work. With a class of half a dozen pupils and perfect freedom, it might be possible to carry on field-work in school hours, but such work could not be included in the ordinary time-table. Practical work is required which can be done in the class-room when the geography period comes round, for field-work could not, in most cases, be seriously considered as part of the school curriculum, and it must be done in leisure hours. To effect any change at present, it was necessary to show how geography could be studied intelligently in forms, and not in sets, with an untrained but intelligent master in charge, and various examination requirements as a prospective end. Mr. Mackinder's three principles implied ideal conditions of work which might be aimed at, but were not likely to be realized for some time to come.

Miss L. **Edna Walter**, Inspector to Board of Education, said that inspiration and ideals were needed, and Mr. Mackinder had given them. One speaker had referred to the lists so often learnt. Those lists were no longer of capes and bays, but, as commercial geography suggested other things, lists of imports and exports. She would set special stress on Mr. Mackinder's statement that the shorter the time at the disposal of the teacher, the more important became the method, and the greater the need for thorough training.

Mr. G. F. **Daniell**, Chairman Education Committee, Teachers' Guild, said that from a schoolmaster's point of view it did not appear that Mr. Mackinder had met the objections to reclassifying pupils into "sets" for different subjects. "Specialists" should be very sparingly employed, but it might be advisable to employ a specialist to teach geography throughout the school, because of the *newness* of the subject in its modern form. It was time we revised our provisions for laboratory work. Instead of chemical and physical laboratories designed for the use of pupils of thirteen and upwards, would it not be better to have junior and senior laboratories and a *sanctum* for the most advanced pupils, and make provision in the junior laboratory for experimental teaching of geography?

Mr. **Mackinder** replied to the objections raised against his proposal that the pupils should be grouped in "sets," by pointing out that boys came to public schools from very different preparatory schools, in which very various ideas of geography prevailed, and that they entered the public school some into one form, some into another, so that there was just danger of omitting essential stages in a progressive curriculum.

REVIEWS.

AFRICA.

UGANDA AND THE UPPER NILE.

'Service and Sport on the Tropical Nile.' By Captain C. A. Sykes, R.H.A.
London: Murray. 1903.

THE author of this book pleads guilty—quite unnecessarily, we think—to the *cacoëthes scribendi*, which assails so many travellers, and which fills the shelves of our libraries with so many productions of an ephemeral character. The book is of a very different nature from the general run of these, for, although it was apparently the love of adventure and the irresistible desire to wander afield which led Captain Sykes to Africa, he possessed the far from common gift of realizing the valuable training and broadening of view which may come to a thoughtful mind from the new experiences gained in a wild country such as Central Africa, and his book shows that he made good use of his opportunities in this direction. He is not content with narrating personal incidents, as do so many of those who travel primarily for purposes of sport, but brings to bear his powers of reflection and observation on the events and scenes with which he has been brought in contact.

Apart from this, the book will take a place of its own in African literature, as dealing with a critical period of transition from the old to the new *régime* in Uganda, about which no large amount has yet been written. Captain Sykes went to Uganda as one of the special service officers sent out at the time of the Sudanese mutiny, and spent two years in the country, during which he traversed many of the outlying districts, and played his part in the establishment of British authority on the Upper Nile, though he did not remain long enough to see communication opened with the Anglo-Egyptian authorities in the north. His spare time was devoted, apart from sport, to such pursuits as entomology, which he found of much interest, and which, with kindred subjects, such as geology, he strongly presses on the attention of those whose lot is cast in similar circumstances, as a means of gaining both enjoyment and intellectual profit. Although much of the country has often been described before, Captain Sykes' vivid descriptions will be read with advantage by those anxious to form a true picture of its character. Special mention may be made of his account of the Murchison falls, which are placed only second to Kilimanjaro—" the most glorious sight on the continent "—for majestic impressiveness.

It is, however, the serious and philosophic spirit displayed throughout which distinguishes the book from the ordinary run of books of travel, and which we could wish were shared by more of those who enjoy similar opportunities. Of the scope for its employment in out-of-the-way regions there can be no doubt, even though Captain Sykes may be inclined to press too hard Shakespeare's dictum that " Home-keeping youth hath ever homely wits."

WEST AFRICA.

'West Afrika.' Von Moritz Schanz. Berlin: Süsserott. 1903.

Without going far from the beaten tracks, Herr Schanz has travelled widely, and is known as the author of various works which stand much above the level of those of the ordinary globe-trotter, on account of the great care with which the author has made himself acquainted with all the information available regarding the countries he has visited, and the thoroughness with which he has studied the economic and other questions presented by them at the present day. His books, therefore, possess considerable value, both for the shrewd personal observations contained in them and the amount of information brought together in a handy form from a great variety of sources. The latest of the series, devoted to the various European possessions in West Africa, is particularly useful for the mass of information which it supplies on the recent development of European activity and commerce in the several spheres, and at a time when more and more attention is being paid to the economic possibilities of that region. It is likely to take a recognized place as an authority, alongside of such works as Mr. E. D. Morel's 'Affairs of West Africa,' though written rather from the point of view of the compiler of statistics, than to further any definite principles or policy. It is not easy to gather whether Herr Schanz has acquired a first-hand knowledge of West Africa, or whether the book is based entirely on material brought together at home. Its form is that of a systematic treatise on the various countries dealt with, preceded by an excellent sketch of the conditions of physical environment, a knowledge of which is of such prime importance in the consideration of the problems which face those interested in the future of the African continent.

EARLY AFRICAN CARTOGRAPHY.

'Topographische Studien zu den Portugiesischen Entdeckungen an den Küsten Afrikas.' I. Von Sophus Ruge. Leipzig: Teubner. 1903.

Prof. Ruge has undertaken what promises to be a most valuable study of the representation of the African coasts on the Portolani and other early maps. His aims, as set down at the outset, are five-fold, and consist in the endeavour to determine the proper form of the names inserted in the Portolani, their proper sequence along the coasts, the date and author of their discovery, the reason for and meaning of the names, and, lastly, to arrive at some conclusion, from a comparison of the legends, as to the date of maps to which no date is assigned on existing copies. A somewhat similar inquiry has been carried out by Mr. Ravenstein, in connection with the voyages of Cão, Diaz, and Vasco da Gama, but Prof. Ruge's investigations are apparently intended to be much more exhaustive, both as regards time and space, and, even where they merely endorse the conclusions of former commentators, will be useful as placing our knowledge of the historical cartography of the African coasts on a more systematic basis than heretofore. From a somewhat broader point of view, the results are instructive as illustrating the *modus operandi* of the makers of Portolani, and showing how, while in some cases names were slavishly copied from one to another, in others a certain amount of critical judgment was displayed.

The present instalment deals with the north-west coast from Tangier to Cape Bojador, on which stretch no fewer than sixty-seven separate names are to be found on one or other of the charts examined. The first section passes these charts in review, from the marginal drawings inserted on manuscripts of Dati's 'La Sfera,' to the map of Saluat de Pilestrina of date 1511, and the conclusions arrived at on disputed points are of considerable interest, even when (as in the case of many of the doubtful dates) they merely suggest probabilities. The list is somewhat more complete than that given by Mr. Beazley in the Hakluyt Society edition of Azurara (to which, strange to say, no reference appears to be made), although for the latter part of the period it has been found possible to speak particularly of only the leading types.* We can only briefly refer to some of Prof.

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* Thus, we find no special mention in this section of the British Museum map by H. Martellus Germanus, nor of the Canerio or Cantino charts, while others are only casually alluded to.

Ruge's views on points of wider interest in the history of cartography. The Dati sketches he is inclined to consider rather as representing a class of early route-maps than as the prototypes of the Portolani. The Pisan chart may, he thinks, date back (as regards its sources, at least) to a time prior to the first Genoese navigations in the Atlantic, while in any case it can only mark the first beginnings of coast-surveys on the Atlantic coasts of Africa, such as were probably inaugurated soon after the Genoese expedition to Ceuta in 1234–35. He throughout strenuously upholds the claim of the Italians, as against the Catalans, to be considered as the first producers of Portolani; accepting the Italian origin of Dalorto's (or "Dulcert's") maps of 1325 and 1339, and pointing to the Italian influence traceable in subsequent Catalan maps.* The second of these two maps of Dalorto's marks a new era in the development of knowledge of the African coasts, the regular succession of names given by it being continued, with comparatively few additions, right through the fifteenth century. Prof. Ruge follows Kretschmer in holding that Perrinus and Petrus Vesconte were two distinct individuals, and also that Petrus was the author of the maps in Sanudo's 'Liber Secretorum fidelium Crucis.' The famous 1448 map of Andrea Bianco ushered in the advance of knowledge respecting the coast south of Cape Bojador, but it is to Roselli, and especially to his chart preserved in the Egerton collection at the British Museum, that the principal merit is assigned for the evidences of a critical spirit displayed. On grounds which are not entirely convincing, Prof. Ruge assigns to this map a date subsequent to 1470. For a comparison of the main types during this period, he gives a table showing side by side the legends occurring on each of the maps from Tangiers to Cape Bojador.

In the second part of the monograph, the author discusses in turn each of the sixty-seven names, tracing the variations in form that are met with in the several maps, and, where possible, identifying them by the aid of ancient or modern descriptions. In the case of some of the names (*e.g.* Rotima, which appeared in one form or another on many maps of the fourteenth or fifteenth centuries, to be finally discarded by Roselli), no satisfactory explanation can be arrived at, while in others the disappearance of the name (*e.g.* Tusimusi, Turocuco, etc.) was due to the decline of the place from former importance. Special attention is given to the legends between Aglu and Cape Bojador, of which a comparative view is again given. Prof. Ruge shows that this permits the conclusion that, as a period of advance was ushered in by the maps of Dalorto in the fourteenth century, so in the fifteenth a new improvement is especially to be dated from the "Ginea Portogalexe" preserved in the Egerton collection at the British Museum.

GENERAL.

EARLY TRAVEL.

'The Text and Versions of John de Plano Carpini and William de Rubruquis as printed for the first time by Hakluyt in 1598, together with some shorter pieces.' Edited by C. Raymond Beazley, M.A., Fellow of Merton College, Oxford.

When the Hakluyt Society contemplated the reprinting of the 'Principal Navigations,' the first volume was assigned to the editorship of Mr. Raymond Beazley. The Society abandoned its intention when a similar undertaking was announced by a Glasgow publisher. But in the meanwhile Mr. Beazley had proceeded with his task with his usual indefatigable industry, and his elaborate

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[*] Prof. Errera has lately shown that Roselli, in his map of 1447, acknowledges the influence of Beccario of Genoa (*ante*, p. 113).

notes were the results of such careful and successful research that the Council thought it right to include this opening portion of the 'Principal Navigations,' with Mr. Beazley's annotations, in a special octavo volume of 345 pages, including index.

Mr. Beazley supplies useful notes for the extracts from Geoffrey of Monmouth, the voyages of Oht-here and Wulfstan, the chapter on the Cinque Ports, and the letter of Ivo of Narbonne; but he has concentrated his attention mainly on the journeys of Carpini and Rubruquis.

Mr. Rockhill has truly said that the narrative of Friar William of Rubruch should reach as high in geographical literature as that of Marco Polo, his better-known successor; and that of Carpini completes and corroborates the story of Rubruquis. Hakluyt printed from a manuscript then in the library of Lord Lumley. In the course of his researches with a view to the collation of Hakluyt's text with existing manuscripts, Mr. Beazley made two important discoveries. The first was that a manuscript in the British Museum, hitherto supposed to be quite distinct from the Lumley manuscript, was identical. The second was the existence of a hitherto unexamined manuscript of Carpini in the library of Corpus Christi College, Cambridge. There are only three other manuscripts, one at Leyden, one in the Bibliotheque Nationale of Paris, and a fifth, which is only a copy of Hakluyt's text, also in Paris.

Of the manuscripts of Rubruquis, there are three at Cambridge, one in London, and one in Leyden.

Mr. Beazley has made a detailed re-examination of these manuscripts, noting the differences between the readings, which entailed an immense amount of labour combined with very profound learning and great critical insight. No one could have achieved such a literary undertaking unless he was endowed with indefatigable perseverance, and with an amount of zeal and devotion to the cause of geographical research which are deserving of the highest commendation. The narratives of the two travellers are worthy of the infinite care that has been bestowed upon them, and geographers owe a debt of gratitude to Mr. Beazley for a work which is really a monument of patient and intelligent research.

CLEMENTS R. MARKHAM.

A GEOGRAPHICAL YEAR-BOOK.

'Geographen-Kalender, . . . herausgegeben von Dr. Hermann Haack.' Erster Jahrgang, 1903–1904. Gotha: Perthes. 1903.

While not intended to take the place of more elaborate works of reference, such as the 'Statesman's Year-book' or Wagner's 'Geographisches Jahrbuch,' this little book, from its compact and handy form, and the inclusion of certain features not found in former publications of the kind, is certain to take its place as an indispensable work of reference for geographers, no matter of what nationality. Besides presenting a valuable bird's-eye view of the progress of geography in all its branches during the past year, it supplies both the geographer and the general reader with a large amount of practical information of a kind which is constantly required, but which is not always easy to obtain ready to hand. Thus the useful tables included under the heading "Kalendarium" supply data respecting the dimensions of the earth, the area of a one-degree trapezium in different latitudes, the lengths of the degree both of latitude and longitude according to the variation of the former, the determination and comparison of map-scales, etc. The second section deals with the events of the year in the field of international political relations, the development of communications, and the like; while the third, from the experienced pen of Dr. H. Wichmann, gives a comprehensive summary of the progress of geographical exploration and research. As in most parts of the work, attention is on the whole given impartially to the work of all nations in this field, and if we miss the names of one or two English travellers (Colonel Manifold and Major Ryder in China, Mr. Campbell in Mongolia, Mr. Hanbury in Arctic America) who have done work worthy of mention, this is probably due to the little that had been published when the section was written on the subject of their journeys. The review of geographical literature, while, of course, making no attempt at exhaustiveness, gives an excellent idea of the most important work done in this direction in all countries during the year. The editor's own section, on educational geography, is one of the most novel features in the volume, but at the same time one in which its comprehensive character is least maintained, for attention has been focussed throughout, no doubt intentionally, on the state of geographical education in the German-speaking countries. The statistical section comprises in a very compact form the principal data regarding all the countries of the world in alphabetical order, while the "Geographisches Adressbuch" is most useful, as giving for the first time the names and addresses of geographers throughout the world, with brief statements of the particular field of activity of each. Altogether the work is calculated to contribute, as purposed by its originators, towards the drawing together of workers in the field of geography all the world over.

THE BRITISH EMPIRE.

'The British Empire Year-book.' By Edgar G. Wall. London: Edward Stanford. 1903.

This large volume, which extends to nearly 1300 pages, and aims at giving the most important statistical and other official information available on England and her foreign and colonial possessions and protectorates, appears this year for the first time. While covering the ground of the 'Colonial Office List,' it renders accessible much additional information for which the statesman and geographer in search of facts would otherwise have to consult, at no little expenditure of time, the consular and Colonial Office reports. The first issue of a work of this nature, dealing as it does with so vast an array of figures and with so many and varied subjects, must of necessity contain imperfections; but we have not noticed any of importance, and the information appears to have been brought up to date, several quite recent appointments being duly recorded. In some cases, perhaps, there is a certain want of proportion. Thus, for example, though Wei-hai-wei is not a very extensive territory, it is of some importance just now, and six lines is hardly sufficient to devote to it, the more so in view of the fact that the last Colonial Office report extended to fifty-seven pages. Similarly, while Labuan occupies five pages, only two are devoted to Sarawak, and but one to British North Borneo. But these are, after all, trivial defects when the general usefulness of the volume is borne in mind.

TROPICAL DISEASES.

'Tropical Diseases.' By Patrick Manson, M.D., F.R.S., etc. New and revised edition London: Cassell. 1903.

The issue of a new edition of Sir Patrick Manson's admirable text-book on tropical diseases illustrates the remarkable progress which has been made within the last ten years in the investigation of diseases which are prevalent in warm climates. The present edition gives clearly and concisely the generally accepted views on the malaria question up to date, and although it is intended for professional readers, it will doubtless be consulted by many travellers who are obliged to encounter, without medical help, the risks of a tropical climate.

Further than this, Sir Patrick gives a great deal of valuable information concerning some of the many parasites which play an important part in the production of disease in the tropics. Ankylostomiasis, which is the name of the disease which gives rise to the extreme form of anæmia which is common in Egypt, and is now known to be present in many other parts of the world, is carefully dealt with. Filariasis, which is directly or indirectly connected with various serious diseases, such as elephantiasis, is fully discussed, and no one is better able to do this than Sir Patrick Manson, who was the discoverer of the fact that the mosquito is the intermediate host in the transference of a certain species of filaria from man to man. This was an important discovery in itself, but still more so in that it led to the suggestion which Sir Patrick afterwards made that the mosquito was concerned in the transmission of malaria, which theory was proved first by Major Ross's patient researches in India and elsewhere.

The latest discovery which finds a place in this volume is the connection of the trypanosome with a serious disease in man. This parasite is responsible for the disease in horses which has for many years been known to be connected with the tsetse-fly. This disease is known as trypanosomiasis, and affords another argument in favour of the adoption of methods of protection from the bites of insects.

Full information will also be found in this new edition as to sleeping sickness, which is proving a most serious hindrance to the development of many parts of Central Africa, and, in fact, information may be obtained concerning all tropical diseases which are known to science. It should be used, at least as a work of reference, by every traveller in the tropics, unless he has access to qualified medical assistance. CHARLES F. HARFORD.

THE GEOGRAPHY OF DISEASE.

'The Geography of Disease.' By Frank G. Clemow, M.D. EDIN., D.P.H. CAMB., Cambridge Geographical Series. 1903.

The inclusion of the subject of the geographical distribution of disease in the Cambridge Geographical Series is an evidence of the rapidly growing importance of this department of geographical science. It is not the first time that an attempt has been made to group diseases according to their geographical relations, but it is only of recent years that it has been possible to do this in any scientific manner, owing to the important discoveries which are now being made as to the causation of diseases. Another reason which has led to new practical interest in this subject is, as Dr. Clemow points out, the colonial expansion of the different European Powers, which has rendered imperative the study of the diseases which are to be met with in different regions of the world.

In earlier times diseases were traced largely to meteorological conditions, such as heat, cold, or moisture, to geological features, or to other special characters of the soil, and in the special prevalence of malaria in low-lying districts, on the banks of rivers, or near the sea coast there appeared to be good proof of the influence of the soil. Dr. Clemow discusses these problems in his introduction, which should be carefully studied before attempting to read the chapters on different diseases, and he shows that, whilst there probably is some foundation for these old theories, the larger number of diseases, and especially of epidemics, are due to the presence of certain parasites. These may be either animal or vegetable, and they may be sufficiently large to be easily detected without any special apparatus, or they may be so small as to require the highest powers of the microscope in order to detect them. The geography of disease is therefore related to the life history of living organisms. Nor is this all. It has been discovered within the last few years that many microorganisms of disease are conveyed outside the human body by the agency of insects, so that the prevalence of the disease may be expected to coincide to a considerable extent with the distribution of these insects, or at least not to go beyond the regions where they are found.

Problems such as these are carefully considered in this interesting volume, which contains a large amount of information which could only have been obtained before from very diverse sources.

There are two methods which might have been adopted in dealing with this subject, one the description of a particular country and the diseases which are to be found in it, or, as Dr. Clemow has done here, the description of each several disease, and the parts of the world in which it may be found. This is probably the most practical plan, but it would have been useful to have supplemented these by a summary showing the diseases which are common in the most important countries. Dr. Clemow has attempted to do this to some extent by a few maps, but these are not, in our opinion, sufficiently large or exact to be of very great service, and it is greatly to be hoped that some one will take in hand the production of a really good atlas of disease. This book does not make any very material addition to our knowledge as to the distribution of the better-known tropical diseases, such as malaria, cholera, plague, or yellow fever; but the articles on various parasites, such as the different varieties of *Filaria*, *Ankylostomum duodenale*, and others of the same class, will probably open the eyes of many to the special risks which are met with in the tropics.

The distribution of the more common infectious diseases of temperate climate, and of those which are common to hot and cold climates, is also discussed; but it is much more difficult in these cases to explain the method of distribution. It is clear that the vast problem which is discussed in this small volume is one which needs a great deal of attention, and should have an important bearing upon the investigation of disease. We congratulate the author upon the large amount of accurate information which he has given us in this small volume. It was no doubt considered that the careful table of contents would take the place of an index, but we think that a detailed index would have been welcome, and we hope it may appear in a future edition. CHARLES F. HARFORD.

GEOGRAPHICAL BIBLIOGRAPHY.

'International Catalogue of Scientific Literature. First Annual Issue. J: Geography, Mathematical and Physical.' London: Harrison & Sons. 1903.

Among the volumes so far published of the first annual issue of this catalogue (which embraces the publications of 1901), we may now number that dealing with Geography, and it is therefore possible to form some idea of the prospective value of the catalogue to students so far as it concerns our own science. In view of the great difficulties which must beset the first inauguration of such an undertaking, in which workers throughout the world have taken part, it is not to be supposed that complete success would be attained at the outset, and it would not be just to regard the results attained in too critical a spirit. But as it is to be presumed that modifications will be introduced in course of time, it may perhaps be permitted to point out some of the directions in which they seem desirable, while fully recognizing the usefulness of the catalogue even in its present form.

There are probably both advantages and disadvantages in the method adopted, according to which the literature of each separate country is brought together by workers within that country. The most important gain—and it is a real one—consists in the fact that many valuable papers which have appeared in less-known periodicals, or such as only occasionally deal with scientific questions, are in this way gathered in, which could hardly be the case were the whole work in the hands of a central organization. On the other hand, entire consistency is hardly to be attained when the interpretation of the rules—not always an easy matter—falls to so many different individuals as have co-operated in the collection of titles. Such lack of consistency is perhaps especially to be expected in the geographical volume, by reason of the limitation of its scope to the Mathematical and Physical sides of the subject, and the difficulty of drawing a hard-and-fast line between these and other branches. It being left to individual workers to decide in each case, it is not surprising to find that, whereas in some cases Physical Geography is interpreted as including general descriptions of the physical features of a country, which are to be found to a certain extent in most books of travel, in others it has probably been taken to refer more exclusively to the principles of the science. Again, while the heading "History," which forms one of the general subdivisions common to all the sciences, was probably intended to embrace only the history of the special branches dealt with, some of the collectors of titles have evidently interpreted it as including the general history of discovery. On this account, it is all the more to be regretted that the scope of the catalogue has been limited so as to exclude all reference to Anthropogeography in its various branches, which may be, and so often is, dealt with in a thoroughly scientific spirit, while the essential unity of Geography as a science in itself is left out of view by such limitation.

The arrangement of the entries within the subject-catalogue (which forms the second half of the work) can hardly be thought entirely satisfactory. The schedule which was issued for the guidance of the workers started, as was but fit, from the two main headings of "Topographical" and "Subject Classification." It was, however, left to individual interpretation to decide whether these were to be used in conjunction (and, if so, which of the two was to be subordinated to the other) or alternatively. The mode of entry most useful to the geographical student would probably have been that in which all works relating to a special region were put down primarily, under the heading of such region, in the topographical classification (this being undoubtedly the most important basis of arrangement to the geographer), while the subject classification was reserved for works dealing rather with special features or principles (special features of definite areas being possibly repeated from the topographical division). It has, however, been decided to subordinate the topographical to the subject arrangement, though the practical disadvantages of this have, it is true, been minimized by the adoption, under "Physical Geography," of a general heading which, in practice, embraces the vast majority of all the entries. A difficulty, however, remains, for although entries which refer, say, to the survey of a particular country, cannot properly be placed under the general physical geography of that country; if this is not done, the references to the literature on any given country are still widely scattered. The extent to which topographical entries have been duplicated under subject-headings also varies enormously. The subdivisions of "Physical" and "Mathematical Geography" are, again, hardly satisfactory, as they are sometimes wanting in logical sequence and a proper subordination of the particular to the general; while, on the other hand, they are far from exhaustive. It is much to be regretted that the admirable classification of the science by Dr. Mill for the card subject-catalogue of our own library could not have been adopted.

As already said, it is a distinct merit of the catalogue that it makes known to students a number of papers occurring in less-known publications, which might otherwise escape notice. Still, the present issue, at least, is by no means complete, for many foreign papers issued in 1901, which are to be found in our own library and subject-catalogue, have not yet found a place in the International Catalogue.

This will, no doubt, be remedied as time goes on. A word of praise should be given, in conclusion, for the great care with which the proof-reading has been done, and the striking absence of typographical errors, which might easily be overlooked where so many different languages are represented.

THE MONTHLY RECORD.

EUROPE.

Ice-formation in the Lakes of the Austrian Alps.—Dr. Johann Müllner treats of this subject in the latest issue of Penck's *Geographische Abhandlungen* (vol. vii. part 2, 1903). After referring to previous work in regard to the freezing of other European lakes done by Forel, Hildebrandsson, Holmsen, and others, and describing the nature of the observations on which the present study is based, the writer examines in turn the phenomena connected with (1) the period preceding the first formation of ice; (2) the interval between this and the closing of the whole lake; (3) the period during which the lakes are ice-bound; and (4) the interval between the first indication of thaw and the complete disappearance of the ice. The course of these events is followed in great detail for a large number of the Austrian lakes, those of the Reschen-Scheideck affording data for the most complete study of the phenomena. In particular, the relation existing between the ice-formation and the air-temperature is brought out in the case of the Reschensee, while a comparative view is given of the duration and thickness of the ice in a large number of lakes for the various years from 1894–95 onwards. The concluding section, in which the influence of geographical position on the duration of the ice-period is discussed, is perhaps of most general interest, though the complexity of the interacting factors is too great for any very definite generalizations to be arrived at, beyond certain general principles which might to a certain extent have been deduced from *a priori* considerations. Other conditions being equal, the duration of the ice naturally varies, as a general rule, with the altitude and latitude of the lakes. Thus while Forel has shown that the lake of the great St. Bernard is frozen, on an average of 39 years, for 268 days in the year, Dr. Müllner found that a 29-years average gave a period of 153 days in the case of the Reschensee. A considerable variation is, of course, observable between different years, but this is found to be generally similar in the case of all the lakes, the degree of variation being, however, greater in the case of low-lying than of high-level lakes. The preponderating influence of the prevailing climatic conditions on the freezing of the lakes is brought out by a table which places the two sets of data side by side, and which shows that the influence of area and depth may be entirely set aside by weather conditions. Differences of geographical position, if accompanied by corresponding climatic differences, naturally exercise an important influence on the freezing and duration of the ice in the case of lakes of approximately equal area and depth. If, however, the volumes of the lakes vary, the phenomena will depend on the combined influence of depth, altitude, and latitude. Dr. Müllner concludes by noting that the available observations are not yet sufficiently complete to permit the solution of all the problems connected with the freezing of the lakes.

The Structure and Surface Features of Austria.—In connection with the recent meeting of the International Geological Congress at Vienna, a work was published on the structure and surface features of Austria, with a preface by Prof. E. Suess, which sums up with admirable clearness the broad characteristics of the country from this point of view. Calling attention to the great variety displayed in the structural features of the country, the professor says, "Between the Moldau and the Danube rises one of the oldest mountain masses of Europe, which passes in the north in the more recently elevated arc of the Sudetian mountains and the Erzgebirge, and in the south into the Eastern Alps, which in turn are prolonged into the arc of the Carpathians. In front of this last is displayed to view, in the trough of the Dneister valley, a portion of the Russian platform, which has remained motionless for so long that even the Silurian rocks are there undisturbed. From the south-east the Dinaric chains approach the Alps, while traces of the old Rhodope massif runs through Eastern Servia towards the Save. Between the members of this great framework the plain extends, filled with marine and lacustrine sediments, which can be traced with unvarying characters down the Danube as far as Lake Aral, and which teach us that all the plains of South-East Europe have in the main been the theatre of a similar course of development. The present relief of Austria is the outcome of the denudation, dislocation, and ablation to which these elements—differing as they do in age, structure, and power of resistance—have been exposed during the long course of ages, and it has been the predisposing cause in moulding the characteristics of the people. And not only the relief, but the distribution of the natural wealth of the land has been dependent on its geographical constitution, as has also its division into forest, pasture, arable land, and steppe. Every charm and contrast of landscape is here present, from the blue rock-girt bay of Cattaro to the glaciers of the Alps, the forest tracts of the Carpathians, or the wide plains of the Bug. All the main formations of the geological series are here represented, all the more valuable ores and minerals are to be met with. . . . And, more important than all, wide tracts are covered with a black covering of humus of exceeding fertility."

The Elk in Norway.—In a recent number of the *Proceedings of the Zoological Society* (1903, vol. i. part 1), Mr. H. J. Elwes gives some notes on the present condition and habits of the elk in Norway, based on his experience while hunting the animal in North and South Trondhjem during six seasons. It appears that within the last forty years the elk has greatly increased in numbers, owing to the cutting down of the legal season for killing the animals, which now varies from fifteen days to a month yearly. Only four of the Norwegian provinces, all of them within the warm and wet climatic area on the south-west coast, are without elk, these being, however, just the provinces in which reindeer are most numerous. The range of the elk seems to be gradually extending northwards. North Trondhjem comes first as regards numbers, and, at least until recently, probably as regards the size of the horns. This province (and South Trondhjem in a less degree) is mountainous, barren, and thinly populated, covered with forests of birch, spruce, and Scotch fir up to about 2000 feet, and the elk are hardly disturbed, over large areas, during eleven months in the year. Their favourite food in summer consists of the twigs of birch, willow, and mountain ash, especially the last, and in winter of the bark and branches of the same shrubs, as well as the twigs of the Scotch fir. In summer they frequent the higher *fjelds* (to 2500 feet and over) to a much greater extent than is generally supposed. Mr. Elwes adds a note as to the supposed existence of a second species of elk from Siberia, holding that this is nothing more than inconstant variety of the European elk.

The Basin of the Ångerman River, Sweden.—Dr. Karl Ahlenius has chosen this basin for the subject of an anthropogeographical study. The drainage area is the second in northern Sweden, 12,590 square miles, that of the Torne river being more extensive, though a large part of it lies outside the boundaries of Sweden. The country is described according to the physical regions marked out by Prof. Högborn (see vol. xxi. p. 75), and the gradual spread of the settlements up from the coast is investigated. Burial mounds, some dating back to the later Stone age, are mostly found in the coast lands near the bays and navigable waterways, the people there living chiefly by fishing and hunting in the woods. Barrows of a later type, containing iron implements, extend up the estuary of the Ångerman river to Sollefteå. Fishing and hunting were still the chief pursuits, and cattle-breeding and agriculture of a primitive description were very gradually introduced. Hence the people still clung to the coast, and hence their name *angermæn* (men of the bays), from which the name Ångermanland is derived. With improved agricultural methods and systematic manuring of the ground, fixed settlements came into existence, many of which in the oldest registers (*Ångermanlands skattebok för* 1547) are compounded of *stad*, *hem*, and *by*. When the open lands and river-terraces in the lower valley had been occupied, the increase of population necessitated the burning down of the woods to form new fields, and there appeared farms with names ending in *böle*, *skog*, *säter*, and *land*. Cattle-stations, too, were formed, to which the cattle were driven in summer, and these tended to increase the area of cultivated lands, for as the manure could not be carried down to the farm, it was often utilized for new fields near the pastures. The clearing of the forest and the introduction of cattle-stations at a distance from the settlements was probably commenced about the year 1200, while the oldest stationary settlements date back to before the Viking age. At first only the coniferous woods in the valley were attacked, and it was not till the immigration of Finns in Central Sweden took place at the end of the sixteenth and the beginning of the seventeenth century that the more distant forests were invaded by settlers. Early in the eighteenth century saw-mills came into general use. Dr. Ahlenius also traces the spread of settlements in the upper valley between the falls and rapids, where *näs*, *ed*, *sjö*, *as*, *sel*, and *mo* appear in the names, indicating a later origin, though some settlements date from the end of the thirteenth century. The lake region seems to have been first occupied in the seventeenth and eighteenth centuries, and most of the settlements in the mountain region in the nineteenth, though some already existed in the eighteenth. The present distribution of settlements is also described, and their situation with regard to exposure and soil, a south or south-west aspect being preferred. A large amount of information has been collected in this pamphlet of 220 pages, which is illustrated by a number of maps. A few more place-names, which in most of the maps are entirely absent, would assist the reader to understand the text.

The Navigation of the Elbe.—The insufficiency of water between Hamburg and the sea for ocean-going steamers has long been a drawback to that port, especially at the time of unusually low tides and unfavourable weather. The German Government have accordingly decided upon carrying out an extensive scheme for correcting the course of the river so as to permanently increase its depth. This, it is estimated, will take some six or seven years to complete, and meanwhile it has been decided to deepen the most difficult section of the river, which is some 10 miles below Hamburg, by dredging. By this means it is hoped to obtain in about two years a uniform depth of 32 feet in the part of the channel referred to. An Elbe-Dneister canal system is also to be put in hand, to permit of traffic between the Black sea and the Baltic.

Diversion of the River Sele.—A scheme of considerable engineering magnitude is about to be undertaken in Italy. It has been decided to use the river Sele, which now flows into the Mediterranean near Salerno, for irrigation, and the contract for the work will be put up to auction on February 1 next. The river is to be tapped in the hills and taken over the other side of the watershed to irrigate the lands on the eastern or Adriatic slopes—an undertaking requiring vast capital and great engineering skill.

Russian Railways.—It is stated that the Russian authorities are contemplating the construction of a railway to connect the European and the West Asiatic systems up to the Persian frontier. The new line in South Russia would pass through Vosnosensk, Nikolaiev, and Kherson to Jankoi. The Jankoi-Kertch line would then be extended on the other side of the straits to Anapa and Novorossisk, in order to make a junction with the Black Sea coast railway, which would have a branch by Erivan. The Black Sea coast railway starts at the station of Armavir, on the Vladikafkaz line, and is to be carried over the Goskh pass to Tuapse, and thence to Sukhum Kale. Still following the coast, the line will be extended to join the trans-Caucasian trunk line at Novo-Senaki, and will be brought as near Zugdidi as circumstances will admit. The effect of this line will be to tap the trade in cereals, which has hitherto found an exit at the port of Novorossisk, and shift the export to Sukhum, which is destined in the future to play an important part in commerce. Further railway developments are to be taken in hand in order to establish communication between the Siberian railway and the Northern Russian system. The excessive traffic at the points where the existing lines cross the Urals—at Kushva on the Perm line and at Zlatust—render further addition to it impossible, and hence it has been decided to construct a line *viâ* Kurgan, Shadrinsk, Ekaterinburg, Krasno-Ufimsk, and Cheptsy. The cost of the continuation is estimated at eight millions sterling. The length of the line is about 800 miles, and as it traverses the most fertile regions, it is likely to develop their agricultural capabilities and assist the mineral industries of the Urals. The Riazan-Volga railway is also to be extended to Astrakhan, a distance of 347 miles.

ASIA.

The Tea Industry in the Caucasus.—A recently issued Foreign Office report, by Mr. Consul Stevens, on the tea industry of the Caucasus (Misc. Series, No. 593, July, 1903), shows that the late extensive experiments in the cultivation of the tea plant in that region are likely to lead to decided success. The portion of the trans-Caucasus most favourable for tea-growing is said to comprise a belt along the Black sea, stretching from Sukhum in the north to the Turkish frontier in the south; climatic and other conditions preventing the zone from extending any great distance inland. The soil of the tea belt varies from a deep red clay to a light blackish earth, the lower hills being entirely covered with forests and brushwood, with a surface soil of loam more or less rich in humus; while the amount of good land that could not profitably be brought under plantation by terracing is relatively small. The climate is generally favourable, the rainfall averaging 96 inches per annum, while the heat is never very excessive. At times, however, droughts, deluges of rain, and frost and snow at the coast-line have done much damage. The bulk of the plants on existing plantations is pure China, but seed has also been imported from India, Ceylon, Java, and Japan. All kinds do well, but the China plant seems especially to thrive. The crop for the last two years has exceeded all expectations. The plantations of the Imperial Domains are under an experienced manager, and seeds and seedlings are furnished by the Domains to any persons desirous of taking up the cultivation, imported seed being no longer used.

The Flora of the Sundriban and its Origin.—A careful study of the flora of the Sundriban of the Ganges delta has lately been made by Major Prain in the Records of the Botanical Survey of India (vol. ii. No. 4). The paper is the outcome of a visit to the Sundriban in August, 1902, but the author has utilized the observations of his predecessors, especially Mr. Heinig and Mr. C. B. Clarke, and is thus enabled to give a more complete account of the flora of the region than has yet appeared, while it is of special interest to geographers from the care taken to bring out the influence exerted by external conditions on the vegetation. The paper begins with a topographical description of the region, calling attention to the contrast between the western part—in which the rivers are not immediate distributaries of the Ganges, but are throughout subject to tidal influence—and the centre and east, where the rivers bring down enormous volumes of fresh water during the rains, and exercise a marked influence on the character of the vegetation. In the west and centre the islands are mainly forest-clad, while grassy savannas with cultivation form a large part of the eastern area. In the west the forests are mainly of the mangrove type, except towards the north, where, as in the central district, the prevailing species is the "Sundri" (*Heritiera minor*), which gives its name to the whole region. In describing the vegetation in detail, the author distinguishes between the clearings, whether existing or abandoned, and the swamp-forests. The former show plants introduced, either intentionally or by accident, through the agency of man. Many of them, particularly the mounds and platforms of higher ground which mark the sites of old clearings, as *e.g.* at Jatta, supply excellent examples of persistence under favourable conditions, the surrounding forest actually protecting the introduced plants against outside competition. The majority of the species in existing clearings do not occur in the swamp forests at all. Of the species occupying parts which have never been cleared, a distinction is drawn between those occurring on the sand-hills of the sea-face, and those of the muddy river-banks or swampy islands, nearly 40 per cent. of the former not occurring elsewhere in the Sundriban. Again, different parts of the swampy area are characterized by different forms, the riparian fence, *e.g.*, having its own special characters. Both the mangrove and "sundri" forest show a remarkable absence of undergrowth, another feature shared between them being the development of root-suckers, which in the case of some species produce a decided mechanical effect in holding together the mud. Different species vary considerably in their power to adapt themselves to a greater or less degree of brackishness. Inasmuch as the whole region is, geologically speaking, new land, all the species may be regarded as introduced, and an attempt is made in the paper to determine which of the possible agencies of transport have been most active in the various subdivisions. In the swamp forest man has naturally done little or nothing, the principal agents being the wind and the sea, while the species introduced by birds or by the washing down of their seeds by the great rivers are comparatively rare. The characteristic grass of the savannas (*Phragmites Karka*, var. *cincta*) also doubtless owes its introduction to wind agency. Of the sea-face flora two-thirds is of littoral type, and thus probably owes its introduction to the sea, though birds, the wind, and rivers have here too done something. The species of abandoned sites do not include any likely to have been introduced by the sea or by rivers, but, in addition to human agency, that of birds, especially fruit-eating birds, and in a less degree that of the wind, seems to have been operative. In the flora of existing settlements water-birds have probably made their influence felt more than elsewhere. The species introduced by man, either intentionally or inadvertently, have evidently come from the north and west, and a northerly origin seems assignable to those introduced by water-birds, and, naturally, by rivers. Those brought by fruit-eating birds, by the wind, and by the sea are, on the contrary, mainly characteristic of the Malayan region.

Japanese Expedition to Chinese Turkestan.—On August 16, 1902, a party of Japanese set out from England to explore the ruins of Buddhist temples in Chinese Turkestan. The leader was Mr. K. Otani, a Fellow of this Society, and among the party was Mr. M. Hori, who had spent a year at the School of Geography at Oxford. From letters received at Oxford from Mr. Otani and Mr. Hori, the following brief abstract is compiled. The party left Osh, on the trans-Caspian railway, on September 8, 1902, and after thirteen days arrived at Kashgar, most of the party suffering from mountain sickness on the Terek Davan. From Kashgar they went to Tashkurgan, where, owing to the lateness of the season and the need for being in Japan early in 1903, it was necessary for the party to break into two, Mr. Otani traversing the mountains to India, leaving Messrs. Hori and Watanabe to carry on the explorations in the Tarym basin. From Tashkurgan Messrs. Hori and Watanabe crossed by the Khandar Davan (16,540, Deasy) on yaks, reaching Yarkand in nineteen days, and after a fortnight's stay they left for Khotan, where they spent six weeks, working hard at Turki and Chinese. On New Year's day 3 or 4 inches of snow fell at Khotan, and on January 2, 1903, they began the hardest part of their travels—the journey down the Khotan darya to Aksu, which took twenty-three days. Meteorological observations were taken three times a day; the range of temperature observed was from —36° Fahr. to +31° Fahr. The cold was so great that they could not get to sleep in the tent, yet five of the native followers always managed to do so outside, round the fire, with a fur coat thrown over their heads. From Aksu the party returned to Kashgar, and on March 5 started for Kucha *viâ* Aksu and Bai, a journey which nominally occupies twenty-five days, but for which they took over two months, owing to a number of *détours*. Over three months were spent at Kucha, from which centre numerous expeditions were made to all the interesting places in the neighbourhood. Mr. Hori writes, " Kucha is, I think, the most interesting place in Chinese Turkestan for the traveller, because of the abundance of religious and historical ruins. We visited seven Min-Ui (= 1000 houses) of Buddhist temples and many other ruins in the circle of two days' march from Kucha." Messrs. Hori and Watanabe expected to reach Urumtsi before the end of September, and ultimately to pass through China by Hankou, where they hope to be about the end of the year.

The Orographical Features of Korea.—Our knowledge of the physical geography of the Korean peninsula is so imperfect that the attempt which has been made by the Japanese geologist, Dr. B. Koto, to trace the main outlines of the structure-lines of that country in the *Journal of the College of Science*, Tokyo (vol. xix. art. 1, 1903), is particularly valuable. During a recent visit to Korea, Dr. Koto traversed the peninsula in all directions, and the basis of actual scientific observation thus obtained marks a new step towards a more accurate knowledge, even though in points of detail the views put forward may be still to a large extent speculative. Dr. Koto draws a forcible parallel between Korea and the Italian peninsula as regards the principal external features, both being divided off on the north by transverse ranges sinking to a well-marked lowland, although, as he points out, there are naturally many differences, both in respect of outer form and geological structure. Thus, while in Italy, the Apennines run along the central axis of the country, in Korea the principal mountains occur on the side of the Sea of Japan; and whereas Italy is not wanting in young geological formations, Korea is mainly composed of archæan and palæozoic rocks. It may be divided on many grounds into two well-marked sections, a northern and a southern, separated by the trench or depression of Chyuk-ka-ryong, which affords the easiest passage across the peninsula from the Sea of Japan to the Yellow sea. The two sections differ alike in their history, climate, topography, and people. The " Han-land " (South Korea) is hilly, though lofty mountains crown the coast of the Japanese sea. In North Korea two topographic types can be distinguished, the one being the Kaima plateau in the north, the other the old Chyo-Syon land, a hilly region, but with an average elevation considerably lower than that of South Korea. Dr. Koto distinguishes five main systems of structure-lines. The first, which he classes with the Sinian system of South China, as originally traced by Pumpelly, consists of broad folds of archæan formations, running from south-south-west to north-north-east, or from south-west to north-east, and occupying nearly half the area of the peninsula. To the north-east the folds appear to unite with the structure-lines of the Sikhota-alin. A second system, contemporaneous or a little later, trends from west-south-west to east-north-east (or in the case of the celebrated Chang-pai-Shan, from west to east) in the Kaima land, and forms apparently the direct continuation of South Manchuria. This is described as the Liau-tung range or system. Thirdly, a very characteristic system runs generally north and south along the axis of the peninsula. This Dr. Koto calls the Korean system, which is remarkable as seeming to be not matched, in its direction, by any other mountains of South-East Asia. It is divisible into two natural subgroups. Next comes the Han-san range, on the southern margin of the peninsula. It is of later age than the Korean system, but its influence is to be traced, jointly with that of the Korean folds, in the peculiar features which characterize this southern coast. Lastly, a great number of small ridges or fault-scarps traverse like a gridiron the whole of the Chyo-Syon land, breaking it up into a number of long orographic blocks, mainly of grey tabular limestone. They seem to be the after-effect of the great tectonic disturbances which gave to the crust-block of the peninsula its present form. The paper is accompanied by an excellent map, in which the main structural lines are laid down. Dr. Koto has also done good service by compiling an extensive list of Korean place-names, with their Romanized spellings. This has been issued as a separate publication.

Navigation of the Yang-tse-kiang.—Writing on the subject of trade development on the Yang-tse, the British consul at Chungking expresses the opinion that through steamers between this town and Ichang are probably not feasible from a commercial point of view, the river between Ichang and Kwei-fu being difficult, and the conditions varying so greatly between the winter and summer months. He considers, however, that specially built steamers might profitably run during the greater part of the year between Wanhien, Chunking, and Suifu, and visit the northern tributaries in summer months. H.M.S. *Woodcock* visited Suifu, and passed into the Min river as far as Kiating two years ago. Next summer she reached a point 40 miles above Kiating, and on the Yang-tse main stream arrived at Ping-Shan, the highest point of navigation for junks. She also ascended the Kialing, reaching a point about 80 miles from Chungking. It is probable that no development of the Suchuan trade will take place without better means of communication. At present goods destined for Chunking have to undergo three transhipments, and from Ichang have to be hauled up in a small junk by trackers, a journey of some five or six weeks at low water.

AFRICA.

German Expedition to the Upper Benue and Lake Chad.—This expedition, to which brief reference was made in the *Journal* for June last (p. 676), returned to Lokoja in July, after successfully accomplishing the main tasks entrusted to it. After completing its work on the watershed between the Benue and Shari basins, it proceeded north to Lake Chad, going north *viâ* Dikwa and returning by a more easterly route by the Logone. Here there was naturally less to do from a purely geographical point of view, and the attention of its leader, Herr Bauer, was directed rather to a study of the economic possibilities of the land. His conclusions were summed up in the *Deutsche Kolonialzeitung*, for July 23 last. Especially was he struck with the large production of corn in Bornu, large areas being described as veritable cornfields. The production is much above the needs of the inhabitants, and a considerable amount is exported. The Bornu natives (by whom this cultivation is carried on) appear to have made a favourable impression, and not only is the proportion of those able to read and write said to be greater than among the Fulbe, but the knowledge of the people is better grounded than among the latter. Herr Bauer considers that the views of Colonel Pavel with regard to the trade of Dikwa were somewhat over-sanguine, for, owing to recent changes in the trade-routes from Southern Adamawa, its market has much declined in importance, while the amount of European goods brought by the Tripoli merchants has also fallen off. Ostrich feathers are the one important article of export, but the trade in these is very considerable. Gulfei, on the Shari, is, however, the centre of the ostrich-farming district, and is the point on which European enterprise should be directed. From an agricultural point of view Herr Bauer is disposed to rate highly the possibilities of German Bornu. In a later number of the *Kolonialzeitung* (No. 40, October 1) a report appears by Herr Edlinger, a mining engineer attached to the expedition, on the geographical and geological results of the expedition so far as they relate to the Upper Benue region. The route chosen on the outward journey to Ngaumdere followed more or less closely the eastern and south-eastern watershed of the Benue on the side of the Logone, and thus helped to define it more precisely than hitherto. North of 8° the basin extends beyond 15° E. Its south-eastern border is very mountainous, the highest summit measured being a double-peaked granite ridge, which was named the Sachse-Spitze (4395 feet). Nearer Ngaumdere the conical peaks of the Ngau Mbum were thought to reach 5500 feet. The water-parting follows a line of high ground running west-south-west and east-north-east, which seems to fall in a steep escarpment to the north. To the south of it, the Mao Mbina, perhaps the most important head-stream of the Logone, flows for a distance in a parallel direction. The principal source of the Benue seems to be at the point where it was placed by Flegel and Passarge, but the elbow which has been marked on the maps between 8° and 9° N. does not seem to exist. The main eastern feeder of the river is the Mao Shufi, brought to light for the first time by the expedition. At Garua the Benue had a breadth of 200 yards and a depth of 2 feet, but in the rains it rises 10 to 13 feet, and the width extends to 500 yards. A full report on the geology of the country will be issued when the collections have been examined, but meanwhile some notes are given. In the orientation of the ranges the directions observed by Passarge (west to east and north-north-east to south-south-west) seemed to prevail. Gneiss and granite play an important part in the structure of the country, the Benue sandstone (interspersed with some conglomerate) being the only sedimentary formation represented. No signs of valuable minerals were found, but this is attributed to the difficulties in the way of a thorough examination while on the march.

M. Chevalier's Explorations on the Borders of Darfur and Wadai.—We have already given an outline (*ante*, p. 85) of the first results obtained by M. Chevalier in his explorations in the Eastern Shari basin, as described by him in a communication printed in *La Géographie*. In the August number of the same periodical a further letter is printed, which sketches the geography of the more northern districts traversed by the expedition, which, as already mentioned, penetrated to the previously almost unknown region immediately to the south-west of Darfur. The slight first-hand information previously possessed about this region was due to the Journeys of Potagos from the east and Hanolet from the south, while a certain amount of native information, not always easy to piece together, had been collected by earlier travellers in Darfur and Wadai. Although the fact is not mentioned by M. Chevalier, it is interesting to find that the name Dar Kulla, spoken of more than a century ago by Browne, with the river flowing westward through it which gave rise to so many speculations at the time of Mungo Park's last journey, finds a place on the sketch sent home by the traveller in the form Dar Gulla, the river appearing also as the upper course of the Auk, one of the northern branches of the Shari. From a hydrographical point of view, this region is of much interest. The sandstone plateau, of an altitude of 2000 to 2800 feet, which occupies the meeting-ground of the Shari, Congo, and Nile basins, falls to the north to a plain some 400 feet lower, covered with a monotonous vegetation, which in turn sinks gradually to a vast annually inundated tract, measuring some 140 miles by 50. This is the plain of Mamun, with an altitude of about 1500 to 1600 feet, through which the streams that rise in the southern plateau run in many interlacing branches. All these watercourses finally unite to form the so-called Auk, a name used by Nachtigal for this branch of the Shari, but which really represents the generic term for river ("Au") in the Tunga language. The principal branch is said to be the Bungul, which, when full, occupies a bed over 12 feet deep, and spreading to a width of 300 to 500 yards. According to M. Chevalier's sketch, the more northern branch, the Minja of Potagos, has a still longer course, and carries the Shari basin eastward to about 23°. M. Chevalier thinks that the Auk might be ascended during winter by boats of some size. During the rains this whole region becomes a vast lake filled with aquatic vegetation, from which the slightly elevated pieces of ground rise as more or less wooded islands. The district simply swarms with large mammals, and water-birds also abound. The vegetation is that characteristic of the Sudan, including species of *Diospyros*, *Terminalia*, *Combretum*, etc. The country, however, is a poor one, and the Gulla people (who belong to the Bagirmi stock) would before this have disappeared before the raids of the people of Wadai and Darfur, were it not for the refuge afforded by the marshes and annual inundation. Taken as a whole, the countries east and south of Wadai are said to possess only a moderate value. Rubber is almost entirely absent, and the inhabitants have suffered much from the incursions of the Mohammedans, who, so far from introducing civilization, have only left traces of their oppression.

The Transkei Gap.—An interesting paper on the striking morphological feature in South Africa known as the Transkei gap, by Messrs. Rogers and Schwarz, of the Geological Survey, is printed in a recently issued part of the *Transactions of the South African Philosophical Society* (vol. xiv. Part i. 1903). The so-called gap is a valley or trough running in a nearly straight line from east to west through the country, and due, not, like a "rift-valley," to the sinking of a strip of country between vertical faults, but to the intrusion into the sedimentary rocks of the district, and subsequent weathering, of a vertical dyke of an easily decomposed crystalline rock allied to diorite. It is suggested that the Beagle channel south of Tierra del Fuego may have owed its origin to a similar cause, for were the Transkei gap to be carried below sea-level, a very similar appearance to that described by Darwin would be produced. Although the term "gap" seems hardly applicable to such a feature, it is pointed out that the actual appearance of the valley quite gives the impression that the Earth has gaped or opened. The gap is reduplicated in several places, and there is an offset at right angles to the general direction. It has been traced from the sea at the mouth of the Kogha river for a distance of 50 miles, and is apparently continued across the Kei river into the Cape Colony for an equal distance. A striking feature is the arrangement of the streams within the gap, which often crosses by low "neks" from one valley to another, even while it maintains a straight course. This is best marked in the section between the Kobongaba river and the Nxaxo pass. Before the formation of the gap-valleys the rivers appear to have wandered over the surface of the plateau, into which they have since cut deep trenches by reason of the gradual elevation of the land. It was during this elevation that certain of the minor streams took the course followed by the dioritic dykes, which offered the least resistance to the erosive forces to which they were subjected.

Climatology of St. Helena.—The only meteorological station in St. Helena is placed about 1900 feet above sea-level, and records are taken only once a day. The total rainfall for the year past was 34·74 inches—nearly 4 inches below that of the previous year. Rain fell on 254 days, but the greatest fall in one day did not exceed 1·41 inches. June, July, and August are the wettest months. The prevailing wind ranges from east-south-east to south-east, and on only seven days was it recorded as calm. The highest maximum shade temperature was 78°, on February 6; the lowest minimum 62°, on September 1.

AMERICA.

Stream Contest along the Blue Ridge.—The Blue Ridge, appropriate enough as a name in Northern and Central Virginia, is not truly descriptive of the heights along which the divide between the Mississippi and Atlantic rivers runs in the south of Virginia and in North Carolina, which is an escarpment descending from the hilly and mountainous upland of the western drainage area to the rolling and hilly lower land of the eastern streams. The shorter eastern streams with steeper gradients are rapidly cutting their valleys and pushing the divide eastwards. Special instances are studied by Prof. Davis in the *Bulletin* of the Geographical Society of Philadelphia (III. No. 5, April, 1903). This retreating escarpment, unlike that of the Cotswolds, is essentially independent of structure, for it is carved in a body of heterogeneous and disordered crystalline schists whose variation in resistance to weathering has only a secondary influence on the topographic form, and the escarpment is due, according to Mr. Davis, mainly to the land surface being degraded to a lower level by the short rivers of the Atlantic system than by the long rivers of the Mississippi system. This differs from the explanation of Messrs. Hayes and Campbell, who consider it the result of retrogressive erosion on the steeper eastern side of a tilted peneplain (cf. *Nat. Geog. Mag.*, vi. (1894), pp. 75, 76).

The Geography of Boston, U.S.A.—In connection with the meetings of the National Education Association at Boston in July last, the *Journal of Geography* issued a special number, devoted entirely to the Geography of Boston under its various aspects, which supplies an instructive lesson on the influence of geographical environment on the growth and fortunes of a centre of human activity. The first two papers, by Profs. R. E. Dodge and G. H. Barton, sketch the general characters of the site of Boston and its surroundings, showing how the present surface features are the outcome of the action of the old ice-sheet on previously existing topography, and how the striking character of the coast has influenced the economic development of the site. Of the major topographic features, the drumlins, formed by the accumulations of the Glacial period, play an important part in determining the picturesque scenery of the Boston basin, almost all of the islands in the harbour, as well as the main features of the neighbouring mainland, owing their present form at least to this cause. Other papers describe excursions in and around Boston, the Boston Park system, Boston as a centre of industry, and the geographic development of the city, the last two being especially instructive. It is pointed out that of the three lowlands of weak rocks lying on the border of the hard rocks of the New England upland, and forming the sites of the three cities of Boston, Providence, and New Haven, the Boston basin alone looks towards Europe, and was thus naturally the centre of the great Puritan immigration. It became "the largest of many important colonial seaports; it supplied the capital and leadership for establishing large interior factory cities at convenient water-powers; it was the natural centre for railroads, and largely shared in building them. As a result, it became the best port for importing the raw materials of manufacture, the natural centre for the head offices and sales agents of New England corporations, the port for exporting goods to other lands and shores." Many of the main streets of old Boston mark geographic features formerly of importance, but now almost forgotten, while in its development Greater Boston shows in a marked degree the influence of its physical geography. "The hills, valleys, islands, marshes, estuaries, etc., have helped or hindered the settlement and growth of the many village sites which are now included in metropolitan Boston." A series of maps shows the extent of settlement at various periods from 1650 onwards. Already at that date many sites had been chosen around Boston bay, so that "there were a large number of towns around the central 'hub' at the foot of the three mountains which were later to be taken in to form the spokes of the wheel of Greater Boston." Old Boston was at first very much isolated from the surrounding towns, the only connection on land being the neck on the southern side, but by 1800 bridges had supplied a connection with Cambridge and Charlestown, in the west and north. Among other results of the natural conditions of the site is the extensive modern system of parks and reservations, which now cover an enormous area, and have to a great extent been kept in their natural state. By its symmetrical arrangement of hills and rivers, a more or less orderly distribution of highways and buildings, and consequently of open spaces for recreation, has been brought about, the ground forbidden to the trader and builder affording unequalled advantages for the latter purpose. An unusual feature is also the system of "park-ways" which tie the various reservations to each other, and bring them within reach of the people of the cities.

The "Guns" of Lake Seneca.—A short note on a phenomenon of detonation in Lake Seneca, New York, apparently analogous to the famous "Barisal guns" of the Ganges delta, the "mistpoeffers" of the North sea, and the like, appears in the *Monthly Weather Review* for July last (p. 336). Writing from Dresden, Yates county, New York, Mr. W. A. Prosser says that the "guns" of Lake Seneca are evidently caused by gas escaping from the sand at the bottom. Off Long point on the west side of the lake the water is very deep. Heavy currents pass either north or south at regular intervals, and a heavy wind for a few hours will change the position of the extreme point by several rods. When the swell is not too heavy, the gas can always be seen rising in bubble form, while natural gas is found in considerable quantity within 3 or 4 miles. The editor remarks that it may well be that the "Barisal guns" have their origin in a similar escape of gas.

MATHEMATICAL AND PHYSICAL GEOGRAPHY.

Secular Variation of Rainfall.—Dr. Hann contributes a valuable discussion of the long series of rainfall observations which have been made at Padua (1725–1900), Milan (1764–1900), and Klagenfurt (1893–1900) to the *Sitzungsberichte der Kaiserlichen Akademie für Wissenschaften* (*Math. Naturwiss. Classe*, cxi.). Even with bloxamed means he can find no connection between the sun-spot period of eleven years and the variations in rainfall, but, on the other hand, there is distinct evidence of the thirty-five year periodicity which Brückner of Bern first expounded. The periods are 1626–60, 1761–95, 1796–1830, 1831–65, 1866–1900, the mean of the dry periods being 1738, 1773, 1808, 1843, 1878, (1913), and of the wet periods 1753, 1788, 1823, 1859, 1893, (1928); but the Paduan figures require to be shoved forward ten years to agree with those of the others.

The Original Home of the Tiger.—In a note printed in the *Proceedings of the Zoological Society* (1903, vol. i. part i.), Colonel C. E. Stewart suggests that the tiger was originally not a native of India, but a purely northern animal, which has gradually extended its range southward. He points out that while Sanskrit possesses a word for "lion," it has none to designate the tiger, and that apparently no allusion to a tiger in India can be traced to a period anterior to the early Mohammedan conquerors. No allusions to tiger-hunts occur in the monuments of the kings of Assyria or Persia, while, though Marco Polo mentions the tiger, he does not speak of it as an Indian animal. The absence of the tiger from Ceylon indicates, in his opinion, that there were no tigers in India prior to the separation of the island.

A Sixteenth-century Globe.—We have received from the well-known bookseller, Herr Ludwig Rosenthal of Munich, an extract from his catalogue describing a sixteenth-century globe now in his possession, with a reproduction in the form of gores of the features delineated on it, as well as a photograph of the globe itself. The globe, which has not been long known to geographers, was briefly described, from a hasty inspection, by M. Harrisse, in the *Revue de Géographie* for September, 1895 (vol. 37, p. 175), the same writer adding notes on other somewhat similar globes, which had likewise been newly brought to light, in the same journal in the following year. Herr Ludwig's reproduction permits a more exact idea to be formed of the character of the globe, and its delineation of the world as known at the time of its construction. As stated on the globe itself, it was made in 1530 by Robert de Bailly, and is chiefly remarkable as among the earliest geographical documents to show the results of Verrazzano's voyage of discovery, the part of North America visited by that navigator being named on it "Verrazzana." In its representation of Central and North America it follows the type of which the map by Vesconte de Maiollo (1527) is the best-known example (see reproduction of the latter in Weise's 'Discoveries of America,' 1884). The globe is noteworthy, also, for its delineation of the supposed southern continent, which is very similar to that of the well-known double cordiform map of Orontius Finaeus (1531), the inscription "Brasielie Regio" appearing, as on the latter, to the south of the Indian ocean, though the large projecting land-mass inscribed by Finaeus as "Regio Patalis" is not to be seen. For Southern Asia the Ruysch type is followed by both De Bailly and Finaeus, though the former differs in separating (as does Maiollo) Asia from America by a broad tract of ocean. As on other maps of the period, the Asiatic inscription "Catticora" has, however, remained attached to South America. It may be noted that, though Hakluyt in his "Particular Discourse" (1584) refers to a globe showing Verazzano's discoveries as existing in "the Queen's privie gallery at Westminster," this can hardly have been the one above described, as it was thought by Hakluyt to have been of Verrazano's own making, and had, besides, inscriptions in Italian, whereas those in De Bailly's globe are in Latin.

GENERAL.

The R.G.S. Syllabuses of Instruction in Geography.—It has for some time been felt by those interested in the improvement of geographical teaching, that some authoritative guidance in regard to the methods and courses of study most applicable to the end in view is very desirable. The want has now been met through the action of the Council of the R.G.S., which, in response to requests from various teaching bodies, has issued two syllabuses, the one intended as a guide to geographical teaching in elementary, the other in secondary schools. The work on the first syllabus, which had been undertaken by the late Mr. T. G. Rooper, has since his regretted death been completed by Mr. G. G. Chisholm, while the secondary syllabus has been prepared by Mr. H. J. Mackinder. After preliminary remarks on the function of geography, the elementary syllabus sketches the various stages by which the study of geography should progress during the passage of the child through the school until the age of 14, or thereabout, is reached. In the syllabus for more advanced study, Mr. Mackinder plans a course suitable for pupils between 13 and 17, the arrangement of the pupils in sets for the special purposes of this branch of study being recommended. The need for problem-solving in geographical study, and the value of setting of essays involving a knowledge of physics, or mathematics, and history, as well as geography, are pointed out, as is also the importance of bearing in mind that "nothing should be taught as an isolated fact, and yet that the line of argument should be so chosen that in the end every essential fact of the World's geography, which should be known to an educated man or woman, would have been learnt in its due setting of related facts, and in its proper perspective."* The syllabuses are suggestive, and not dogmatic. They attempt to guide the teacher preparing the course for his own classes by indicating the essential points, and at least one sequence or presentation of educational value; and it is hoped that the suggestions will be of service especially to teachers who cry out that too much is demanded of them—that they have too wide a subject and too little time for it. If the new effort of the R.G.S. to improve geographical teaching does nothing more, it should convince such teachers that a wide subject can be successfully dealt with only by carefully planning the course, so that there is a progressive development of the quality of the work, as well as increase in the quantity of the topographical knowledge. The great fault of most geographical courses at present is that the more advanced classes deal only with the more remote regions, whereas they should tackle the more advanced problems whether of lands near or far. When this is done, and due attention is paid to regular observational and practical exercises, geography will prove to be so valuable an educational discipline that if more time is needed for it that time will be granted. Teachers of geography have first of all to show that it is worth more than the time allotted to it at present. This report will help them to do so.

OBITUARY.

John Allen Brown.

JOHN ALLEN BROWN, who passed away September 24, at his residence in Ealing, aged seventy-two years, became a Fellow of our Society in 1861, the year in which his father, John Brown, died, whose membership dated back to 1837, and his obituary notice appears in the *Gentleman's Magazine* of May, 1861. The interest in his father's Arctic and Antarctic literary work was continued as a filial duty by his sons, the eldest of whom is the subject of our present memoir, but it was as a geologist and anthropologist, rather than as a geographer, that he made his name known in scientific circles. The work to which he devoted the leisure of many years, the antiquity of man, has been preserved in numerous papers on the subject of the evidences supplied by his own discoveries of flint implements, of which he leaves an important collection, and it was his pride and pleasure to show his museum of these treasures to any one who showed an interest in this very practical department of the records of pre-historic man. His desire to connect the palæolithic and neolithic periods by a term which should be applicable to those implements coming between the roughly-fashioned flint and the chipped and polished implements was the outcome of a long investigation of the subject, and his proposed *mesolithic* period will no doubt be accepted for purposes of classification. Allen Brown was not a man to sit still and let life pass in casual engagements, his capacity for work leading him years ago to promote free libraries, to literary productions, and lectures on his particular studies. He was a member of the Geological Society and the Anthropological Institute, and a Justice of the Peace for the county of Middlesex.

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* A fuller account of Mr. Mackinder's views will be found on p. 549, and in the *Geographical Teacher* for October.

D. W. KETTLE.

CORRESPONDENCE.

Relief Maps and Globes.

Mount Vernon, New York, East Fourth Street.

I HAVE read with much interest Prof. Reclus's address on the subject of relief maps and relief globes, and an experience of twenty years leads me to agree pretty closely with his conclusions. During the time in which I have been working upon the matter, however, my own opinions as to the use and value of relief maps and models have materially changed. My first impressions were that all reliefs should be rigidly true to scale—that is, there should be no vertical exaggeration. The experience of many thousand teachers, in the course of three or four years, convinced me that in many instances such a plan was untenable. In other words, when young children are to be considered, the logical is not always the psychological. The sense-perceptions of pupils ten or twelve years of age are not so keen as those of adults, and slight differences in relief, which mean much to the latter, mean nothing to the former.

After making this discovery, I was not slow to change my plan. The first model constructed on the new plan was a relief of South America. It was made by the brothers Mindeleff of the United States Geological Survey, both of whom were not only topographers of note, but artists as well. The vertical exaggeration was 10 : 1, and, although it pleased the thousands of teachers who used it, I am constrained to say that I think the vertical exaggeration was greater than necessary. Mr. Alfred Russel Wallace condemned it in this respect.* The models subsequently constructed had a vertical exaggeration of 5 : 1. This, I am inclined to think, is about right for Asia, but rather too great for Europe.

And here is the point I wish to make: the model of a very large area demands a vertical exaggeration varying from 2 : 1 to 5 : 1; the models of small areas need none. Moreover, when we consider the fact that the sense-perceptions of young pupils are not fully developed, I see no impropriety in using more than one vertical scale in the same model. In literature truth is often inculcated by fiction; in the training of the sense-perceptions it may be properly inculcated by exaggeration. The experience of many thousand teachers gathered during a score of years in educational work is far better evidence to me than all the logic and arguments of the college and university men to the contrary. The child is instructed by what he can discern, and not by what he cannot discern.

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* Dr. Tyndall saw no objection to it.

The foregoing, it is hardly necessary to say, applies to the younger pupils of the elementary schools. For older pupils who have been taught to conventionalize, the contour map is generally preferred by teachers to the relief map or the model. Such pupils have been taught to use the imagination, and they are generally able to get correct mental pictures from the conventionalized map. The elaborately finished model, which is designed to show physiographic processes and effects, however useful it may be in the university laboratory or the museum, has no place in the elementary school. It may be added that any relief or model that gives untrue character to topography should be instantly discarded. Unfortunately, much freakish topography that has no likeness in nature has been foisted upon schools both at home and abroad.

A good relief globe that can be furnished for a low price is something greatly to be desired, and if Mr. Patterson's globe can be manufactured so as to be sold for, say, two pounds, I am inclined to think the venture of making and marketing them will be a good one. I see nothing to prevent its being done at the figure quoted, and the good results that will arise from the use of such globes cannot be questioned. As a matter of fact, while we go through the dry formality of mentioning a round earth early in the pupil's course of study, we hustle him through a world that is absolutely flat, and bury him under the surface of it when he is dead.

JACQUES W. REDWAY.

The Pangong Lake.

20, Wellesley Road, Gunnersbury, October 5, 1903.

In the March number of the *Geographical Journal*, p. 257, Dr. Sven Hedin says that the Pangong lake formerly belonged to the basin of the Indus. I think he must have intended to say the basin of the Shayok, for it does not lead into the Indus basin until 200 miles lower down, and is in a valley parallel to that of the Indus, but about 50 miles to the north of it, with very high mountains between.

Dr. Sven Hedin also says that the water of the Pangong lake is slightly salt. The fact is that there are two, or rather three, Pangong lakes, the upper two being fresh and draining into the lowest one, which, having no outlet, is salt. In 1871 Sir Edward Frankland analyzed for me some water taken from the lowest lake; the detailed result is given at p. 370 of 'Lahore to Yarkand,' the total salts being 1297 parts in 100,000, chiefly sulphate of soda and chloride of sodium.

GEO. HENDERSON.

Cheap Ordnance Survey Maps for Teaching Purposes.

School of Geography, Oxford.

May I through your columns call the attention of your readers to an important concession which has recently been made to schools by the Board of Agriculture? Most teachers know how necessary Ordnance Survey maps are for sound class teaching in local geography, but the price has hitherto been prohibitive. In response to memorials from various sources, the Board of Agriculture has now issued instructions that special editions of the one-inch outline sheets be supplied to educational authorities at the following prices: 200 copies, £1 5*s.*; 500 copies, £2; 1000 copies, £3; 5000 copies, £12. For larger numbers the estimated price would be £2 per 1000 copies. The only stipulation made is that on no account are the maps to be sold. It is universally agreed that all sound geographical teaching must begin in a study of the home region, and it is therefore to be hoped that most teachers will avail themselves of the facilities so generously granted, either individually or by making application through the local education authority.

A. J. Herbertson,
Hon. Sec. Geographical Association.

GEOGRAPHICAL LITERATURE OF THE MONTH.

Additions to the Library.

By EDWARD HEAWOOD, M.A., *Librarian*, R.G.S.

The following abbreviations of nouns and the adjectives derived from them are employed to indicate the source of articles from other publications. Geographical names are in each case written in full:—

A. = Academy, Academie, Akademie.
Abh. = Abhandlungen.
Ann. = Annals, Annales, Annalen.
B. = Bulletin, Bollettino, Boletim.
Com. = Commerce.
C. Rd. = Comptes Rendus.
Erdk. = Erdkunde.
G. = Geography, Geographie, Geografia.
Ges. = Gesellschaft.
I. = Institute, Institution.
Iz. = Izvestiya.
J. = Journal.
k. u. k. = kaiserlich und königlich.
M. = Mitteilungen.
Mag. = Magazine.
Mem. = Memoirs, Mémoires.
Met. = Meteorological.
P. = Proceedings.
R. = Royal.
Rev. = Review, Revue.
S. = Society, Société, Selskab.
Sitzb. = Sitzungsbericht.
T. = Transactions.
V. = Verein.
Verh. = Verhandlungen.
W. = Wissenschaft, and compounds.
Z. = Zeitschrift.
Zap. = Zapiski.

On account of the ambiguity of the words *octavo*, *quarto*, etc., the size of books in the list below is denoted by the length and breadth of the cover in inches to the nearest half-inch. The size of the *Journal* is 10 × 6½.

A selection of the works in this list will be noticed elsewhere in the "Journal."

EUROPE.

Alps. *Jahrb. Schweiz. Alpenclub.* **38** (1902–1903): 299–326. **Forel, Lugeon, and Muret.**
Les variations périodiques des glaciers des Alpes. Par Dr. F. A. Forel, Dr. M. Lugeon, et E. Muret. Vingt-troisième rapport.—1902.

Alps. *Jahrb. Schweiz. Alpenclub.* **38** (1902–1903): 231–243. **Knonau.**
Die Alpen im Kriege des Konsuls Bonaparte gegen die Kaiserlichen im Frühjahr 1800. Von G. Meyer von Knonau.

Austria. *T. Edinburgh Geolog. S.* **8** (Special Part) (1902–3): pp. x. and 180. **Gordon.**
The Geological Structure of Monzoni and Fassa. By Maria M. Ogilvie Gordon, D.SC. *With Maps, Sections, and Illustrations.*

Belgium—Lesse. **Van den Broeck and Rahir.**
Mém. S. Belge Géologie **17** (1903): 119–144.
La Lesse souterraine. La traversée des deux boucles de la rivière à Furfooz démontrée au moyen de la fluorescéine. Par E. Van den Broeck et E. Rahir. *With Map and Illustrations.*

English Channel—Sailing Guide. **Jenkins.**
The Pilot's Guide for the English Channel; comprising the South Coast of England, and general directions for the navigation of the Channel. Edited by H. D. Jenkins. London: Imray, Laurie, Norie, & Wilson, 1903. Size 9½ × 6, pp. vi., xvi., and 190. *Charts, Plans, etc. Presented by the Publishers.*

France. *B.S.G. Lille* 40 (1903): 11-19. **Malotet.**
Le pays de l'Oise moyenne et de la Haute-Somme Vermandois. Par A. Malotet.

France—Map. *Ann. Club Alpin Français* 29 (1902): 513–529. **Arnaud.**
Appendice complémentaire et explicatif de la carte de l'État-Major. Par F. Arnaud, suivi d'une lettre de Maurice Paillon.

France—Seine-et-Oise. *C. Rd.* 137 (1903): 279-281. **Dollfus.**
Sur les effondrements de la plaine de Sevran. Note de G. F. Dollfus.

Germany. **Hellmann.**
Regenkarte der Provinzen Hessen-Nassau und Rheinland sowie von Hohenzollern und Oberhessen. Mit erläuterndem Text und Tabellen. In amtlichem Auftrage bearbeitet von Prof. Dr. G. Hellmann. Berlin: D. Reimer, 1903. Size 10½ × 7, pp. 56. *Map.*

Germany. *Forsch. deutsch. Landes- u. Volksk.* 14 (N. 6) (1903): 517–676. **Wagner.**
Die Bevölkerungsdichte in Südhannover und deren Ursachen. Von Dr. E. Wagner. *With Map.*

Germany—Baltic Coasts. **Wegener.**
Deutsche Ostseeküste. Von Georg Wegener. (Land und Leute. Monographien zur Erdkunde, vii.) Bielefeld and Leipzig: Velhagen & Klasing, 1900. Size 10½ × 7, pp. 168. *Maps and Illustrations. Price 4s.*

Germany—Bavaria. **Haushofer.**
Oberbayern, Munchen, und bayerisches Hochland. Von Prof. Dr. Max Haushofer. (Land und Leute, Monographien zur Erdkunde, vi.) Bielefeld and Leipzig: Velhagen & Klasing, 1900. Size 10½ × 7, pp. 120. *Map and Illustrations. Price 3s.*

Germany—Berlin. **Zobeltitz.**
Berlin und die Mark Brandenburg. Von Fedor von Zobeltitz. (Land und Leute. Monographien zur Erdkunde, xiv.) Bielefeld and Leipzig: Velhagen & Klasing, 1902. Size 10½ × 7, pp. 192. *Map and Illustrations. Price 4s.*

Germany—Harz. **Günther.**
Der Harz. Von Fr. Günther. (Land und Leute. Monographien zur Erdkunde, ix.) Bielefeld and Leipzig: Velhagen & Klasing, 1901. Size 10½ × 7, pp. 128. *Map and Illustrations. Price 3s.*

Germany—North Sea Coasts. **Haas.**
Deutsche Nordseeküste, Friesische Inseln und Helgoland. Von Prof. Dr. H. Haas. (Land und Leute. Monographien zur Erdkunde, viii.) Bielefeld and Leipzig: Velhagen & Klasing, 1900. Size 10½ × 7, pp. 176. *Map and Illustrations. Price 4s.*

Germany—Rhine. **Kerp.**
Am Rhein. Die Rheinlande von Frankfurt bis Düsseldorf und die Thäler des Rheinischen Schiefergebirges. Von H. Kerp. (Land und Leute. Monographien zur Erdkunde, x.) Bielefeld and Liepzig: Velhagen & Klasing, 1901. Size 10½ × 7, pp. 184. *Map and Illustrations. Price 4s.*

Greece—Ithaca. **Salvator.**
Sommertage auf Ithaka. [By the Archduke Ludwig Salvator.] Prague: H. Mercy Sohn, 1903. Size 15 × 11½. *Plates. Presented by the Archduke Ludwig Salvator.*

This sumptuous volume consists of a series of heliogravures from the author's own sketches.

Holland. *Angewandte G.* 1 S, 6 Heft (1903): pp. 122. **Menne.**
Die Entwickelung der Niederländer zur Nation. Eine anthropogeographische Skizze. Von Dr. Karl Menne. *With Illustrations.*

An attempt to bring out the geographical basis of the history of Holland.

Hungary. *Meteorolog. Z.* **20** (1903); 255-264. **Hegyfoky.**
Die Schwankung der Aufblüheszeit und die Temperatur in Ungarn. Von J. Hegyfoky.

Hungary. **Popescu.**
Beiträge zur Entstehungsgeschichte des oberen Oltthales. Inaugural-Dissertation von S. D. Popescu. Leipzig, 1902. Size 9 × 6, pp. 94. *Presented by the Author.*

Iberian Peninsula—Mosquitoes. **Pittaluga.**
Atti R.A. Lincei, Rendiconti **12** (1) (1903): 529-538.
Sulla presenza e distribuzione del genere *Anopheles* in alcune regioni della penisola Iberica, e suoi rapporti col parassita della malaria umana. Nota del dott G. Pittaluga.

Iceland. *G. Tidskrift* **17** (1903-1904): 93-109. **Thoroddsen.**
Geografiske og geologiske Undersøgelser ved den sydlige Del af Faxaflói paa Island. Af Prof. Dr. T. Thoroddsen.

Italy. *Traductions et Reproductions S. Belge Géologie* **17** (1903): 69-75. **Alippi.**
Les Boniti du Monte Nerone. Par Tito Alippi.

"Boniti" are detonations of the nature of those known elsewhere as "mistpoeffers."

Italy—Abruzzi. *La G., B.S.G. Paris* **8** (1903): 1-12. **Squinabol**
Une excursion à Capracotta en Molise. Observations de géographie physique sur un territoire mal affermi. Par S. Squinabol. *With Illustrations.*

Italy—Carrara. *Tour du Monde* **9** (1903): 325-336. **Brontelles.**
Carrare: la cité du Marbre. Par M. Reymond de Brontelles. *With Illustrations.*

Italy—Gravity. *Atti R.A. Lincei, Rendiconti* **12** (1) (1903): 483-490. **Riccò.**
Riassunto delle determinazioni di gravità relativa fatte nella Sicilia Orientale, in Calabria e nelle isole Eolie. Nota del A. Riccò. *With Map.*

Italy—Lombardy. *B.S.G. Italiana* **4** (1903): 345-349. **Bertolini.**
Sulla permanenza del significato estensivo del nome di Lombardia. Nota del Prof. G. Lod. Bertolini.

Italy—Riviera. **Hörstel.**
Die Riviera: von W. Hörstel. (Land und Leute. Monographien zur Erdkunde, xi.) Bielefeld and Leipzig: Velhagen & Klasing, 1902. Size 10½ × 7, pp. 132. *Map and Illustrations. Price* 4*s.*

Italy—Rome. **Kaemmel.**
Rom und die Campagna. Von Otto Kaemmel. (Land und Leute. Monographien zur Erdkunde, xii.) Bielefeld and Leipzig: Velhagen & Klasing, 1902. Size 10½ × 7, pp. 188. *Map and Illustrations. Price* 4*s.*

Italy—Sardinia. *Ann. G.* **12** (1903): 272-275. **Mori.**
Jonction géodésique de la Sardaigne au continent. Par A. Mori.

North Sea. ———
North Sea Pilot. Part i. Shetland and Orkneys. Being the result of various surveys made by order of the Lords Commissioners of the Admiralty.. Fifth Edition. London, 1903. Size 9½ × 6, pp. xxii. and 256. *Chart. Price* 2*s.* 6*d.* *Presented by the Hydrographer, Admiralty.*

Norway. **Monckton.**
On the Recent Geological History of the Bergen District of Norway. By H. W. Monckton. [Reprinted from the *Proceedings of the Geologists' Association*, vol. xviii. part ii., 1903.] Size 8½ × 5½, pp. 53-70. *Presented by the Author.*

Russia—Dnieper. *La G., B.S.G. Paris* **8** (1903): 75-88. **Wybranowski.**
Le régime du Dniepr. Par R. de Wybranowski.

Russia—Gulf of Finland. **Piccard.**
Beiträge zur physischen Geographie des Finnischen Meerbusens. Inaugural Dissertation . . . Von E. F. Piccard. Kiel: K. Jansen, 1903. Size 9½ × 6½, pp. xii. and 124.

Sweden—Maps. **Lönborg.**
Sveriges Karta tiden till omkring 1850. Af Sven Lönborg. Uppsala: Almqvist & Wiksell, 1903. Size 10 × 7, pp. vi. and 242.

On the history of the Cartography of Sweden down to 1850.

Switzerland. **Rhodes.**

A Pleasure-Book of Grindelwald. By Daniel P. Rhodes. New York and London: Macmillan & Co., 1903. Size 8½ × 5½, pp. xvi. and 236. *Map and Illustrations. Price 6s. net. Presented by the Publishers.*

Descriptive sketches of the neighbourhood of Grindelwald and its people, intended for holiday travellers.

Switzerland. *B.S.G. Lyon* 18 (1903): 135–156. **Goegg.**

Le Percement du Simplon et la question des voies d'accès françaises. Par G. Goegg. *With Map and Illustrations.*

Switzerland—Cartography. **Becker.**

Jahrb. Schweiz. Alpenclub 38 (1902–1903): 327–340.

Fortschritte in der Kartographie, Begleitwort zu der Karte der Kurfirsten-Säntisgruppe. Von Prof. F. Becker.

United Kingdom. *Quarterly J. Geolog. S.* 59 (1903): 337–347. **Arnold-Bemrose.**

Geology of the Ashbourne and Buxton Branch of the London & North-Western Railway—Crake Low to Parsley Hay. By H. H. Arnold Bemrose. *With Illustrations.*

United Kingdom—Cheviot Hills. **Kendall and Muff.**

T. Edinburgh Geolog. S. 8 (1903): 226–230.

On the Evidence for Glacier-dammed Lakes in the Cheviot Hills. By P. F. Kendall and H. B. Muff.

United Kingdom—Cornwall. *Quarterly J. Geolog. S.* 59 (1903): 408–428. **Parkinson.**

The Geology of the Tintagel and Davidstow District (Northern Cornwall). By J. Parkinson. *With Map.*

United Kingdom—Fisheries. **Herdman.**

The Future of British Fisheries Investigation. By Professor W. A. Herdman. (Extracted from Prof. Herdman's 'Report on the Lancashire Sea Fisheries Scientific Investigations for 1902.' Trans. Biological Society of Liverpool, vol. xvii., 1903.) Liverpool; C. Tinling & Co., 1903. Size 8½ × 5½, pp. 39–54. *Sketch-Map. Presented by the Author.*

United Kingdom—Forestry. *Quarterly Rev.* 198 (1903): 81–104. **Nisbet.**

The Improvement of British Forestry. By J. Nisbet.

United Kingdom—Gales. *Quarterly J.R. Meteorolog. S.* 29 (1903): 151–179. **Brodie.**

The Prevalence of Gales on the Coasts of the British Islands during the thirty years 1871–1900. (Second Paper.) By F. J. Brodie. *With Diagrams.*

United Kingdom—Geology. **Jukes-Browne and Hill.**

Memoirs of the Geological Survey of the United Kingdom. The Cretaceous Rocks of Britain. Vol. ii. The Lower and Middle Chalk of England. By A. J. Jukes-Browne, with contributions by William Hill. London, 1903. Size 10 × 6, pp. xiv. and 568. *Map, Plates, and Illustrations. Price 10s. Presented by the Geological Survey.*

United Kingdom—Ireland. *P.R. Irish A.* 24 (Sec. C) (1903): 153–168. **Bury.**

The Itinerary of Patrick in Connaught, according to Tírechán. By Dr. J. B. Bury.

United Kingdom—Ireland. *P.R. Irish A.* 24 (Sec. C) (1903): 133–152. **Falkiner.**

Some Illustrations of the Commercial History of Dublin in the Eighteenth Century. By C. Litton Falkiner. *With Plates.*

United Kingdom—London. *J.R.I. Brit. Architects* 10 (1903): 461–468. **Fleming.**

The Architectural Development of London. By O. Fleming.

United Kingdom—Meteorology. ——

Bognor Climatological Society. Annual Report and Results of the Observations made during the year 1902, at the Bognor Climatological Station, Lat. 50° 47′ N., long. 0° 40′ 30″ W. Height above mean sea-level, 20 feet. Bognor. Size 9 × 5½, pp. 14.

United Kingdom—Norfolk. *Quarry* 8 (1903): 336–341. ——

The Mineral Industry of the United Kingdom. XIII. Norfolk. *With Map and Sections.*

United Kingdom—Place-names. *Halifax Naturalist* 8 (1903): 35–37. ——

Some Place-names and their Meanings.

Vistula. *Ann. G.* **12** (1903): 214–234. **Auerbach.**

Le régime de la Vistule. Par B. Auerbach.

ASIA.

Annam. *B. l'École Française d'Extrême-Orient* **3** (1903): 164–205. **Cadière.**

Les lieux historiques du Quang-binh. Par le R. P. Cadière. *With Maps.*

Asia. *Quarterly Rev.* **198** (1903): 155–177. **Colquhoun.**

Asia in Transformation. By A. R. Colquhoun. *With Map.*

Central Asia—Tian Shan. *Petermanns M.* **49** (1903): 134–137. **Friederichsen.**

Beiträge zur Morphologie des zentralen Tiën-schan. Von Dr. Max Friederichsen. (Auszug eines auf dem XIV. Deutschen Geographentage in Cöln gehaltenen Vortrags.)

Ceylon. *J. Linnean S. (Botany)* **36** (1903): 430–463. **Parkin and Pearson.**

The Botany of the Ceylon Patanas.—II. By J. Parkin and H. H. W. Pearson. *With Plates.*

The former paper appeared in the same journal in 1899 (vol. xxxiv. pp. 300–305, *with map*). The present paper discusses the influence of external conditions on the biological characters of the plants of the patanas (grass-lands).

China—Cartography. **Chavannes.**
B. l'École Française d'Extrême-Orient **3** (1903): 214–247.

Les deux plus anciens spécimens de la cartographie chinoise. Par E. Chavannes. *With Maps.*

These two maps were engraved in 1137 A.D. The originals are now in the museum at Singan-fu.

China—Chekiang. *J. China Br. R. Asiatic S.* **33** (1899–1900): 261–283. **Walshe.**

The Ancient City of Shaohing (Province of Cheh-kiang). By the Rev. W. G. Walshe.

China—Sechuan. *J. China Br. R. Asiatic S.* **33** (1899–1900): 105–119. **Vale.**

Irrigation of the Ch'eng Tu Plain. By J. Vale.

China—Wei-Hai-Wei. **Lockhart.**

Wei-Hai-Wei. Report for 1902. Colonial Reports, Annual No. 388, 1903. Size 10 × 6½, pp. 58. *Price 3d.*

Contains notes on meteorology.

China—Yang-tse. *La G., B.S.G. Paris* **8** (1903): 65–74. **d'Anty.**

La navigation à vapeur dans le bassin supérieur du Yang-tseu. Par P. Bons d'Anty.

Eastern Asia. *Contemporary Rev.* **84** (1903): 189–208. **Ular.**

Russia, Manchuria, and Mongolia. By A. Ular.

Eastern Asia—Formosa and Luchu. *Petermanns M.* **49** (1903): 159–162. **Futterer.**

F. v. Richthofens Geomorphologische Studien aus Ostasien. III. Die morphologische Stellung von Formosa und den Riu-kiu-Inseln. Von Prof. Dr. K. Futterer.

French Indo-China—Saigon. *Rev. Maritime* **157** (1903): 1377–1402. **Castex.**

Le nouveau port de Saïgon. Par R. Castex. *With Maps and Plan.*

India—Himalayas. *Jahrb. Schweiz. Alpenclub* **38** (1902–1903): 212–227. **Guillarmod.**

Un record dans l'Himalaya. Par le Dr. J. Jacot Guillarmod. *With plates.*

Account of the Anglo-Austrian Expedition of 1902.

India—Historical. **Jackson.**

Historical Records of the XIII. Madras Infantry. Compiled by Lieutenant R. P. Jackson. London, Calcutta, and Simla: Thacker & Co., 1898. Size 10 × 6½, pp. 320. *Plates. Presented by the 13th Madras Infantry.*

India—Historical. *Blackwood's Mag.* **174** (1903): 220–236. **Forrest**

The Tragedy of the Black Hole. By G. W. Forrest.

The writer endeavours to give an accurate version of the events connected with the Black Hole tragedy, which have been the subject of considerable misapprehension.

India—History. **Davids.**

Buddhist India. (Story of the Nations.) By T. W. Rhys Davids. London: T.

Fisher Unwin, 1903. Size 8 × 5, pp. xvi. and 332. *Map and Illustrations. Price 5s. Presented by the Publisher.*

India—Trigonometrical Survey. ——
Account of the Operations of the great Trigonometrical Survey of India. Vol. xvii. Electro-Telegraphic Longitude Operations executed during the years 1894–95–96. The Indo-European Arcs from Karachi to Greenwich. Dehra Dun, 1901. Size 12¾ × 9½, pp. xviii., 320, and 12. *Map, Portrait, and Plates. Price Rs.10 8 annas. Presented by the Survey of India Department.*

India—Water-supply. *Imp. and Asiatic Quarterly Rev.* **16** (1903): 30–42. **Ward.**
Suggestions for increasing the Water-supply in Central India, and for the prevention of Floods. By G. E. Ward.

India and Tibet. *Blackwood's Mag.* **174** (1903): 372–380. **Kennion.**
Lapchak. By R. L. Kennion.

On the tribute-bearing mission from Ladak to Lhasa.

Indo-China. *B. l'École Française d'Extrême-Orient* **3** (1903): 248–303. **Pelliot.**
Le Fou-nan. Par P. Pelliot.

Fu-nan was a Hinduized state often spoken of in Chinese documents from the third to the seventh century, the identification of which has been a matter of some difficulty.

Japan—Formosa. **Campbell.**
Formosa under the Dutch, described from Contemporary Records, with Explanatory Notes and a Bibliography of the Island. By Rev. Wm. Campbell. London: Kegan Paul, Trench, Trubner & Co., 1903. Size 8½ × 6½, pp. xiv. and 630. Frontispiece. *Price 12s. net. Presented by the Publishers.*

Japan and Manchuria. *Questions Dipl. et Colon.* **16** (1903): 198–220. **Labbé.**
Au Japon et en Mandchourie, Souvenirs de l'an dernier. Par P. Labbé. *With Map.*

Malay Archipelago—Krakatau. *Naturw. Wochenschrift* **2** (1903): 495–498. **Seckt.**
Die Fortschritte der Flora des Krakatau. Von Dr. H. Seckt. *With Illustrations.*

Cf. note in the *Journal* for July (*ante*, p. 82).

Persia and Turkey. *B. American G.S.* **35** (1903): 1–7. **Shedd.**
The Syrians of Persia and Eastern Turkey. By W. A. Shedd.

Philippine Islands. *B. American G.S.* **35** (1903): 66–68. ——
Earthquake and Volcanic Centres in the Philippines. *With Map.*

Russia. *Asien* **2** (1903): 120–123, 158–159. **Krahmer.**
Neue Pläne für den Bau von Eisenbahnen in Russisch-Asien. Von Generalmajor z. D. Krahmer.

Russian Central Asia. *Asien* **2** (1903): 133–137. **Hartmann.**
Die Verwaltung der russischen Provinz Turkestan. Von Prof. Dr. M. Hartmann.

Siam. *B.S.G. Marseille* **27** (1903): 20–34. **Deloncle.**
La question du Siam. Conférence de F. Deloncle.

Tongking. *B.S.G. Rochefort* **25** (1903): 57–61. **[d'Auriac].**
La baie d' Ha-long.

Turkey—Asia Minor. *P.S. Biblical Archæology* **25** (1903): 225–233, 250–258. **Pilcher.**
The Jews of the Dispersion in Roman Galatia. By E. J. Pilcher. *With Plate.*

Turkey—Syria. **Dussaud.**
Notes de Mythologie Syrienne. Par René Dussaud. Paris: E. Leroux, 1903. Size 10 × 6½, pp. 68. *Illustrations.*

Turkey—Syria. **Dussaud and Macler.**
Mission dans les régions désertiques de la Syrie moyenne. Par R. Dussaud avec la collaboration de F. Macler. (Extrait des *Nouvelles Archives des Missions Scientifiques*, t. x.) Paris: E. Leroux, 1903. Size 10 × 6½, pp. 342. *Map and Illustrations.*

On a journey for archæological research.

AFRICA.

Africa. *J. African S.* **2** (1903): 349–358. **Johnston.**
Presidential Address. The Work of the African Society. By Sir H. H. Johnston, G.C.M.G.

Africa—Orthography. *J. African S.* **2** (1903): 456–459. ——
The orthography of African Names and Languages. By the Editor.
The Society's system has been adopted with a few modifications.

Algeria. *Ann. Club Alpin Français* **29** (1902): 303–326. **Reynier.**
L'alpinisme en Algérie, ascensions dans la chaîne du Djurjura. Par A. Reynier. *With Map and Illustrations.*

British Central Africa. *J. African S.* **2** (1903): 380–399. ——
Extracts from Letters by F. H. M., an Official in the N.E. Rhodesian Service of the British South African Company. *With Illustrations.*

British Protectorates. ——
Africa, No. 9 (1903). Memorandum showing Position of the Four African Protectorates administered by the Freign Office in June, 1903, arranged in Chronological Order of Date of Administration. London: Eyre & Spottiswoode, 1903. Size 13½ × 8½, pp. 10.

Central Africa. *Mouvement G.* **20** (1903): 370–375. **Chevalier.**
L'exploration du Dar Banda. Par A. Chevalier. *With Maps.*

Central Africa. *Mouvement G.* **20** (1903): 256–257. **Coupé.**
Exploration des affluents de l'Ubangi, les rivières Ibenga et Botapo. Par M. Coupé. *With Map.*

Congo State—Katanga. *Mouvement G.* **20** (1903): 250–254, 278–280. **Grey and Farrell.**
Au Katanga.

East Africa. *Z. Ges. Erdk. Berlin* (1903): 254–279, 398–421. **Engler.**
Ueber die Vegetationsformationen Ost-Afrikas auf Grund einer Reise durch Usambara zum Kilimandscharo. Von Prof. Dr. A. Engler.

Egypt. *Geolog. Mag.* **10** (1903): 337–343. **Andrews.**
Notes on an Expedition to the Fayûm, Egypt, with Descriptions of some New Mammals. By Dr. C. W. Andrews. *With Illustrations.*

French Congo. *La G., B.S.G. Paris* **8** (1903): 89–95. **Chevalier.**
Exploration scientifique dans les états de Snoussi, Sultan du Dar el-Kouti. Par A. Chevalier. *With Map.*
See note in the Monthly Record (*ante*, p. 569).

French Congo. *Z. Ges. Erdk. Berlin* (1903): 434–438. **Chevalier.**
Aus Französisch-Congo. Von A. Chevalier.

French Congo. *La G., B.S.G. Paris* **8** (1903): 13–22. **Superville.**
De l'Oubangui à N'Dellé par la Kotto. Par — Superville. *With Map.*

Gold Coast. *J. African S.* **2** (1903): 444–450. **Perregaux.**
A few Notes on Kwahu ("Quahoe," a Territory in the Gold Coast Colony, West Africa). By Rev. W. Perregaux.

Madagascar. *Ann. Club Alpin Français* **29** (1902): 327–343. **Jarnac.**
Une excursion en Émyrne en 1902. Par A. De Jarnac. *With Illustrations.*

Madagascar. *C. Rd.* **136** (1903): 1298–1301. **Colin.**
Travaux astronomiques et magnétiques à Madagascar. Note du P. Colin.

Morocco. *B.S.G. Marseille* **27** (1903): 7–19. **Segonzac.**
Le Maroc. Conférence du Marquis de Segonzac. *With Map.*

Morocco. *Petermanns M.* **49** (1903): 155–159. **Fischer.**
Zur Entwicklung unserer Kenntnis des Atlas-Vorlandes von Marokko. Von Prof. Th. Fischer.

Portuguese West Africa. *B.S.G. Lisboa* **21** (1903): 81–94. **Castro.**
De Noqui ao Cuango, notas de viagem. Por J. Moraes e Castro.

Sahara. *B.S.G. Marseille* **27** (1903): 90–97. **Tournier.**
Les oasis du Touat. Par le Capitaine Tournier.

Sahara—Figig. *B. Comité l'Afrique Française* **13** (1903): 179–184. **Terrie**

Les événements de Figuig. Par A. Terrier. *With Map.*

Sierra Leone. **Walli**

The Advance of our West African Empire. By C. Braithwaite Wallis. London: T. Fisher Unwin, 1903. Size 9½ × 6, pp. xvi. and 318. *Map and Illustrations. Price 21s. Presented by the Publishers.*

The title is somewhat misleading, for although there are one or two chapters o general principles of administration and trade in West Africa, the bulk of the book relates to events in Sierra Leone in 1898, on which it gives valuable information.

South Africa—Orange River. **Parkinso**
T. South African Philosoph. S. **14** (1903): 76–78.

Irrigation on the Orange River. By F. B. Parkinson.

Togo. *Globus* **83** (1903): 309–314, 341–345. **Klos**

Das Bassarivolk. Von H. Klose. *With Illustrations.*

Uganda. ——

Uganda Protectorate Intelligence Report No. 14, with Appendices.—(A). Report on the Nile District, by Captain J. A. Meldon. (B). Report on the Bari tribe, by the same. 1902. Size 13½ × 8½, pp. 10. *Presented by the Foreign Office.*

West Africa. *Rev. Colon.* (1903): 576–599. **Dubo**

Commission française de délimitation du golfe de Guinée. Rapport géographique et ethnographique. Par le lieutenant Duboc. *With Maps.*

Deals with the country on the northern frontier of French Congo.

West Africa—Volta River. **Worsnop**

River Volta from Kpong to Kratchie. By T. H. Worsnop. [Typewritten sheets.] Size 13 × 8, pp. 43. *Presented by the Author.*

NORTH AMERICA.

Canada. *T. Hist. and Sci. S. Manitoba*, No. **63** (1903): pp. 16. **Bryce**

Letters of a Pioneer: Alexander Ross. Edited by George Bryce, LL.D.

Extracts from letters recently brought to light.

Canada. *Nineteenth Century* **54** (1903): 314–324. **Machray.**

'The Granary of the Empire.' By Robert Machray.

Canada—Bibliography. **Wrong and Langton.**

Review of Historical Publications relating to Canada. Edited by G. M. Wrong and H. H. Langton. Volume vii. Publications of the year 1902. The University of Toronto, 1903. Size 11 × 7, pp. xii. and 222.

Canada—Railway. *Scottish G. Mag.* **19** (1903): 422–425. **Begg**

Grand Trunk Pacific Railway Extension. By A. Begg.

Canada—Rocky Mountains. **Bonney.**

The Canadian Rockies. Part ii. On some Rock-specimens collected by E. Whymper, Esq., in the Canadian Rocky Mountains. By Prof. T. G. Bonney, D.SC. [Extracted from the *Geological Magazine*, Decade iv. vol. ix. No. 462, pp. 544–550, December, 1902.] Size 8½ × 5½.

Canada—Rocky Mountains. **Stutfield and Collie.**

Climbs and Exploration in the Canadian Rockies. By Hugh E. M. Stutfield and J. Norman Collie. London, etc.: Longmans, Green & Co., 1903. Size 9 × 5½, pp. xii. and 344. *Map and Illustrations. Price 12s. 6d. net. Presented by the Publishers.*

Describes the several journeys of exploration by the authors from 1897 onwards.

Canada and Alaska. ——

Boundary between the Dominion of Canada and the Territory of Alaska. Case presented on the part of the Government of His Britannic Majesty to the Tribunal constituted under Article 1 of the Convention signed at Washington, January 24, 1903, between His Britannic Majesty and the United States of America. (London. 1903, pp. 106.)
Appendix to ditto. Vol. i. (London, 1903. pp. xi. and 314.)
Counter-case presented on the part of the Government of His Britannic Majesty. etc., etc. (London, 1903, pp. 82.)
Appendix to ditto. Vol. I. (London, 1903, pp. iv. and 100.)
Also Atlas and Portfolio of Maps. Size 13½ × 8½.

Mexico—Boundary. **Blanco.**
Memoria de la Sección Mexicana de la Comisión Internacional de Límites entre México y los Estados Unidos que Restableció los Monumentos de el Paso al Pacífico. Bajo la dirección por parte de México del Ingeniero Jacobo Blanco. Nueva York, 1901. Size 12 × 9, pp. 366. *Illustrations.*

Mexico—Vera Cruz. *B. American G.S.* **35** (1903): 291–294. ——
The New Port of Vera Cruz. *With Plan.*

North America—Geology. **Weeks.**
B. United States Geolog. Surv., No. 191 (1902): pp. 448.
North American Geologic Formation, Names, Bibliography, Synonymy, and Distribution. By F. B. Weeks.

United States. *Petermanns M., Ergänzungsheft, Nr.* 142 (1903): pp. 106. **Blum.**
Die Entwicklung der Vereinigten Staaten von Nordamerika. Bearbeitet und zusammengestellt von Richard Blum. *With Maps.*
Deals with the development of population and economic resources.

United States. **Hulbert.**
Historic Highways of America. Vol. vi. Boone's Wilderness Road. Vol. vii. Portage Paths. The Keys of the Continent. By Archer Butler Hulbert. Cleveland, Ohio: The Arthur H. Clark Co., 1903. Size 8 × 5½, pp. (vol. vi.) 208; (vol. vii.) 194. *Maps and Illustrations.*

United States. **Johnson.**
The High Plains and their Utilization. By Willard D. Johnson. (Annual Reports, Department of Interior, 1900, Part iv., pp. 601–741; 1901, Part iv., pp. 631–669. Washington, 1901–1902.) *Maps and Illustrations.*

United States. ——
Annual Reports of the Departments of the Interior for the fiscal year ended June 30, 1901. Twenty-Second Annual Report of the United States Geological Survey. Part i. Report of the Directors; Part ii. Ore Deposits; Part iii. Coal, Oil, Cement; Part iv. Hydrography. 4 vols. Washington, 1901. Size 11½ × 7½, pp. (vol. i.) 464; (vol. ii.) 888; (vol. iii.) 764; (vol. iv.) 690. *Maps, Plates, etc. Presented by the U.S. Department of the Interior.*

United States—California. **Campbell.**
B. United States Geolog. Surv., No. 200 (1902): pp. 24.
Reconnaissance of the Borax Deposits of Death Valley and Mohave Desert. By M. R. Campbell. *With Map.*

United States—Forests. *La G., B.S.G. Paris* **8** (1903): 23–28. **Hardy.**
Les réserves forestières des Etats-Unis. Par Marcel Hardy.

United States—Green Mountain Region. **Dale.**
B. United States Geolog. Surv., No. 195 (1902): pp. 22.
Structural Details in the Green Mountain Region and in Eastern New York. (Second Paper.) By T. N. Dale. *With Illustrations.*

CENTRAL AND SOUTH AMERICA.

Bolivia. ——
Sinopsis Estadistica y Geográfica de la República de Bolivia. Tomo i. La Paz, 1903. Size 9 × 6, pp. iv. and 394.

Brazil. *Petermanns M.* **49** (1903): 145–149. **Jerrmann.**
Diamantino, an der Grenze der Zivilisation. Von Kapitän Ludwig Jerrmann. *With Map.*

Central America. **Davis.**
Hydrography of the American Isthmus. By Arthur Powell Davis. (Annual Reports, Department of Interior, 1901, Part iv., pp. 507–630.) *Maps and Illustrations.*

Central America. *Globus* **84** (1903): 72–74. **Krebs.**
Flutschwankungen und die vulkanischen Ereignisse in Mittelamerika. Ein Beitrag zur Frage der Beziehungen des Meeres zum Vulkanismus. Von W. Krebs.

Central America—Canal. **Marcel.**

Gabriel Marcel: Un éventail géographique. (Extrait de la *Revue hispanique*. tome ix.) Paris, 1902. Size 10 × 6½, pp. 20. *Map. Presented by the Author.*

On a map printed in the eighteenth century for insertion on a fan, illustrating a scheme for an American interoceanic canal.

Costa Rica. **Pittier de Fábrega.**

Folk-Lore of the Bribri and Brunka Indians in Costa Rica. By H. Pittier de Fábrega. (*The Journal of American Folk-Lore*, vol. xvi. January—March, 1903. No. lx.) Size 9½ × 6½, pp. 9. *Presented by the Author.*

Guatemala. *B. American G.S.* 35 (1903): 231–252. **Eisen.**

Notes during a Journey in Guatemala, March to December, 1902. By G. Eisen, PH.D.

Jamaica. **Pullen-Burry.**

Jamaica as it is, 1903. By B. Pullen-Burry. London: T. Fisher Unwin, 1903. Size 7½ × 5, pp. xvi. and 240. *Map and Illustrations. Price 6s. net. Presented by the Publisher.*

A useful little book for those who contemplate a visit to Jamaica, the advantages of which as a charming winter-resort are dwelt upon by the writer.

Martinique. *Z. Ges. Erdk. Berlin* (1903): 431–433. **Wegener.**

Einige neue Aufnahmen vom Mont Pelé. Von Dr. G. Wegener. *With Plates.*

Peru. ——

Perú. A sketch for capitalists, tradesmen, and settlers. A report on the industries that can be developed and on those that might be introduced. Lima. 1903. Size 7½ × 5½, pp. 58. *Maps and Illustrations. Presented by the Peruvian Government.*

Peru and Bolivia. **Saavedra.**

Bautista Saavedra. El Litigio Perú-boliviano. La Paz, 1903. Size 9 × 5½, pp. 160. *Map. Presented by the Sociedad Geografica de La Paz.*

Porto Rico. **Churchward.**

Trade of Porto Rico for the year 1902. Foreign Office, Annual No. 3027, 1903. Size 10 × 6½, pp. 22. *Price* 1½*d.*

St. Vincent. *Ann. G.* 12 (1903): 261–268. **Lacroix.**

Les dernières éruptions de Saint-Vincent, mars 1903. Par A. Lacroix. *With Plates.*

South America. **Alcock.**

Trade and Travel in South America. By Frederick Alcock. First Edition. London and Liverpool: G. Philip & Son, 1903. Size 9 × 5½, pp. xx. and 574. *Maps and Illustrations. Price 12s. 6d. net. Presented by the Author.*

West Indies. *M.V. Erdk. Leipzig* (1902): xvii.–xx. **Deckert.**

Beobachtungen in Westindien, besonders auf Cuba und Hayti. Par Dr. E. Deckert.

AUSTRALASIA AND PACIFIC ISLANDS.

Australia. *J. and P.R.S. New South Wales* 36 (1902): xxii.–xxxvi. **Cardew.**

The Importance of Federal Hydrography. By J. H. Cardew. *With Diagrams.*

Fiji. **Guppy.**

Observations of a Naturalist in the Pacific between 1896 and 1899. By H. B. Guppy. Volume i. Vanua Levu, Fiji. A description of its leading Physical and Geological Characters. London: Macmillan & Co., Ltd., 1903. Size 9½ × 6, pp. xx. and 392. *Map and Plates. Price 15s. net. Presented by the Publishers.* [To be reviewed.]

New South Wales. **Coghlan.**

New South Wales Statistical Register for 1901 and Previous Years. Compiled from Official Returns by T. A. Coghlan. Sydney: W. A. Gullick, 1903. Size 10 × 6½, pp. xviii. and 1138. *Price 5s. Presented by the Agent-General for New South Wales.*

New South Wales—Hunter River. **Maiden.**

J. and P.R.S. New South Wales 36 (1902): 107–131.

The Mitigation of Floods in the Hunter River. By J. H. Maiden.

New Zealand. *T. and P. New Zealand I.* **35** (1902): 32-45. **Duncan.**
Following the Tracks of Captain Cook. By Russell Duncan. *With Illustrations.*

New Zealand. *T. and P. New Zealand I.* **35** (1902): 24-32. **Hassard.**
Foot-tracks of Captain Cook. By H. D. M. Haszard. *With Plan and Illustrations.*

New Zealand. *T. and P. New Zealand I.* **35** (1902): 387-391. **Marshall.**
The Kingston Moraine. By Dr. P. Marshall.

New Zealand—Geology. *T. and P. New Zealand I.* **35** (1902): 489-546. **Hamilton.**
List of Papers on the Geology of New Zealand. By A. Hamilton.

New Zealand—Maoris. *T. and. P. New Zealand I.* **35** (1902): 12-24. **Walsh.**
The Cultivation and Treatment of the Kumara by the Primitive Maoris. By Archdeacon Walsh.

Niue Island. *J. Polynesian S.* **12** (1903): 1-21. **Smith.**
Niue Island and its People. By S. Percy Smith. Part iv. *With Plate.*

Norfolk Island—Meteorology. ———
Chief Weather Bureau, Brisbane. Special Antarctic Division, Norfolk Island. International Meteorological Co-operation in connection with British and German Antarctic Expeditions, 1901–1903. Australasian Section. Size 9 × 5½. *Presented by Clement L. Wragge, Esq.*

Records the data from October, 1901, to March, 1903.

POLAR REGIONS.

Arctic. *J. Franklin I.* **155** (1903): 417-428. **Faustini.**
About some important Polar Navigations to High Latitudes. By Dr. A. Faustini. Translated from the Italian by E. S. Balch.

The original paper appeared in 'In giro pel Mondo' (Bologna, 1900). It deals with early speculations on an open polar sea and the inception of voyages of discovery.

Arctic. *G. Tidskrift* **17** (1903-1904): 60-68. **Sverdrup.**
Det festlige Sverdrup-Møde. Kaptajn Otto Sverdrups Foredrag. *With Map.*

Arctic—Abruzzi Expedition. **Marinelli.**
Riv. G. Italiana **10** (1903): 193-200, 233-241.
I resultati scientifici della spedizione polare del Duca degli Abruzzi. Considerazioni di O. Marinelli.

Arctic—Eskimo. *Petermanns M.* **49** (1903): 150-151. **Isachsen.**
Die Wanderungen der östlichen Eskimo nach und in Grönland. Von G. Isachsen. *With Map.*

Arctic Exploration. ———
Arctic Exploration. Franklin Search Expeditions, etc. Copy of original letters, MSS., etc., bearing signatures of Arctic Explorers, handed over to authorities of National Portrait Gallery for exhibition in Arctic Section where portraits of authors are on view, by W. H. George, Admiralty, March 1902. [Typewritten.] Size 13 × 8, pp. 17. *Presented by W. H. George, Esq.*

Arctic—Norwegian Expedition. **Schei.**
Preliminary Report on the Geological Observations made during the Second Norwegian Polar Expedition of the *Fram*. By P. Schei. Size 10 × 6½, pp. 10.

Printed on the occasion of the Sverdrup meeting of the R.G.S. The paper contains fuller details than that published in the *Journal.*

Greenland. *Petermanns M.* **49** (1903): 121-123. **Engell.**
Ueber die Schwankungen des Jakobshavns-Gletschers. Von Dr. M. C. Engell. *With Map.*

Greenland. *G. Tidskrift* **17** (1903-1904): 69-92. **Ryberg.**
Om Erhvervs- og Befolknings-Forholdene i Grønland samt Bemærkninger til Oplysning om Grønlændernes nuværende Tilstand. Af Carl Ryberg.

Greenland. *Meteorolog. Z.* **20** (1903): 274-276. **Engell.**
Ueber die Windverhältnisse im Sommer an der Küste von Grönland. Von Dr. Engell.

MATHEMATICAL GEOGRAPHY.

Altitude Determinations. *Petermanns M.* 49 (1903): 163–166. **Hann.**

Bemerkungen über die Schwerekorrektion bei den barometrischen Höhenmessungen. Von Prof. Dr. J. Hann.

Astronomy. **Nasmyth and Carpenter**

The Moon considered as a Planet, A World, and a Satellite. By James Nasmyth and James Carpenter. London: John Murray, 1903. Size 8½ × 6, pp. xx. and 316. *Plates and Diagrams. Presented by the Publishers.*

A new edition of a standard work, brought out in a compact size and at a reduced price, which will make it widely accessible to students.

Cartography. *Riv. G. Italiana* 10 (1903): 12–20, 133–142, 242–250. **Mori**

Origini e progressi della Cartografia ufficiale negli Stati moderni. . . . Dal Prof. Attilio Mori.

Cartography. ——

Service Géographique de l'Armée. Rapport sur les travaux exécutés en 1902. Paris, 1903. Size 10½ × 6½, pp. 38. *Maps and Illustrations. Presented by Colonel d'Amade.*

Surveying. **Clancey**

Aid to Land-surveying (Large Edition), embracing Levelling, Practical Astronomy, etc.; accompanied by 510 illustrations on the subject, and containing numerous useful examples for practice. By J. C. Clancy. Second Edition. Rangoon, 1902. Size 13½ × 8½, pp. v., 252, xvi., and ii. *Plates. Price 8s. Presented by the Author.*

Surveying. **Laussedat**

Recherches sur les Instruments, les Méthodes et le Dessin topographiques. Par le Colonel A. Laussedat. Tome ii. Seconde partie: Développement et progrès de la Métro-photographie à l'Etranger et en France. Paris: Gauthier-Villars, 1903. Size 10 × 6½, pp. 288. *Plates.*

Tables. **Clancey**

Calculating Tables in English, embracing Survey Section, and containing full explanations, examples, and illustrations. By J. C. Clancey. Part I. Revised and Enlarged. Fourth Edition. Rangoon, 1902. Size 13 × 8½, pp. xliv. and 158. *Charts. Price 1s. 4d. Presented by the Author.*

Triangulation. *T. and P. New Zealand I.* 35 (1902): 201–208. **Adams**

The Adjustment of Triangulation by Least Squares. By C. E. Adams.

PHYSICAL AND BIOLOGICAL GEOGRAPHY.

Age of the Earth. *T. Edinburgh Geolog. S.* 8 (1903): 240–255. **Mackie**

The Saltness of the Sea in relation to the Geological Age of the Earth. By Dr. W. Mackie.

Dunes. *Z. Ges. Erdk. Berlin* (1903): 422–430. **Baschin**

Dünenstudien. Von Otto Baschin.

Observations on the formation and movements of dunes on the North sea coast.

Forests and Rainfall. *J. and P.R.S. New South Wales* 36 (1902): 211–240. **Maiden**

Forests considered in their relation to Rainfall and the Conservation of Moisture. By J. H. Maiden.

Geology. *Scottish G. Mag.* 19 (1903): 393–417. **Lapworth**

The Relations of Geology. By Prof. C. Lapworth, F.R.S.

Glaciers. *Ann. Club Alpin Français* 29 (1902): 399–461. **Rabot.**

Commission française des glaciers: Revue de glaciologie, No. 2, année 1902. Par C. Rabot.

Meteorology—Aurora. *T. and P. New Zealand I.* 35 (1902): 405–408. **Skey**

Notes on the Aurora in the Southern Hemisphere. By H. Skey.

Mountain-building. *Quarterly J. Geolog. S.* 59 (1903): 348–355. **Avebury.**

An Experiment in Mountain-building. By the Right Hon. the Lord Avebury. *With Illustrations.*

In this experiment layers of carpet-baize and sand under pressure from above were subjected to the action of two horizontal forces at right angles.

Oceanography. ———
Conseil Permanent International pour l'Exploration de la Mer. Bulletin des Résultats acquis pendant les Courses périodiques, publié par le Bureau du Conseil avec l'assistance de M. Knudsen. Année 1902–1903. Nos. 1–3, 1902–1903. Copenhague: A. F. Høst et Fils. Size 13 × 11, pp. 1–170. *Maps. Presented by the Conseil International pour l'Exploration de la Mer.*

Oceanography—Deposits. *Naturw. Wochenschrift* **2** (1903): 529-533. **Solger.**
Woher stammen die Coccolithen des Tiefseeschlammes? Von Dr. F. Solger. *With Illustrations.*

Oceanography—Relief. *Petermanns M.* **49** (1903): 151-152. **Supan.**
Terminologie der wichtigsten unterseeischen Bodenformen. Im Auftrag der internationalen Kommission für unterseeische Nomenklatur von Prof. Dr. A. Supan.

Phyto-geography. *Monthly Weather Rev.* **31** (1903): 180-184. **MacDougal.**
The influence of light and darkness upon growth and development. By D. T. MacDougal.

Phyto-geography. *Popular Sci. Monthly* **63** (1903): 239-245. **Peirce.**
A Comparison of Land and Water Plants. By Prof. G. J. Peirce, PH.D.

Phyto-geography. **Smith.**
Botanical Survey for Local Naturalists' Societies. By W. G. Smith. (*The Naturalist*, January, 1903.) Size 9 × 6, pp. 14.

River Curves. *Geolog. Mag.* **10** (1903): 350-354. **Ellis.**
River Curves round Alluvial Plains. By T. S. Ellis. *With Diagram.*

Seismology. *Mém. S. Belge Géologie* **17** (1903): 3-12. **Ertborn.**
Le volcanisme. Par le Baron O. van Ertborn.

The author criticizes the views of M. Stanislas Meunier on the subject of volcanic action, and puts forward ideas of his own.

Speleology. *La G., B.S.G. Paris* **7** (1903): 333-353. **Martel.**
XIV^e et XV^e campagnes souterraines (1901 et 1902). Par E. A. Martel. *With Illustrations.*

Tides. *B. American G.S.* **34** (1902): 391-400; **35** (1903): 17-23. **Brownlie.**
Varieties of Tides. By A. Brownlie. *With Sketch-map.*

Zoo-geography. *C. Rd.* **137** (1903): 133-135. **Lesne.**
La distribution géographique des Coléoptères bostrychides dans ses rapports avec le régime alimentaire de ces Insectes. Rôle probable des grandes migrations humaines. Note de P. Lesne.

ANTHROPOGEOGRAPHY AND HISTORICAL GEOGRAPHY.

Anthropogeography. **Grierson.**
The Silent Trade. A Contribution to the Early History of Human Intercourse. By P. J. Hamilton Grierson. Edinburgh: W. Green & Sons, 1903. Size 9 × 5½, pp. x. and 112. *Presented by the Publishers.* [To be reviewed.]

Columbus. **Thacher.**
Christopher Columbus. His Life, his Work, his Remains as revealed by Original printed and manuscript records, together with an Essay on Peter Martyr of Anghera and Bartolomé de las Casas, the First Historians of America. By John Boyd Thacher. Volume ii. New York: G. P. Putnam's Sons, 1903. Size 11½ × 8, pp. vi. and 700. *Maps, Portraits, Facsimiles, etc. Price* 36*s.*

Commercial Geography. **Chisholm.**
Handbook of Commercial Geography. By G. G. Chisholm. Fourth Corrected Edition. London, etc.: Longmans, Green & Co., 1903. Size 9 × 5½, pp. xlvi. and 640. *Maps and Diagrams. Price* 15*s. net. Presented by the Publishers.* [To be reviewed.]

Commercial—Gold. *T. and P. New Zealand I.* **35** (1902): 122-139. **Segar.**
The Flood of Gold. By H. W. Segar. *With Diagram.*

Historical—Astronomy. **Plunket.**
Ancient Calendars and Constellations. By the Hon. Emmeline M. Plunket.

London: J. Murray, 1903. Size 8 × 5½, pp. xvi. and 256. *Diagrams and Illustrations. Price 9s. net. Presented by the Publishers.*

A reprint of papers written at various times, with a view to elucidate the origin of calendars marked by zodiacal constellations. In the first paper the author suggests that the Accadian calendar originated at a time when the *winter solstice* coincided with the sun's entry into Aries, viz. about 6000 B.C.

Historical—Toscanelli. **Marcel.**

Gabriel Marcel. La lettre et la carte de Toscanelli sur la route des Indes par l'Ouest adressées en 1474 au Portugais Fernam Martins et transmises plus tard à Christophe Colomb. Étude critique sur l'authenticité et la valeur de ces documents . . . Par H. Vignaud. Paris: Société Nationale d'Acclimatation, 1903. Size 11½ × 9, pp. 10. *Presented by the Author.*

Islam. *J.R. Asiatic S.* (1903): 467–493. **Margoliouth.**

On the Origin and Import of the names Muslim and Hanīf. By D. S. Margoliouth.

BIOGRAPHY.

Nansen. **Monflier.**

Explorer Nansen's Reception in Rouen. By M. Georg Monflier. (MS.) London. 1903. Size 10½ × 9, pp. 90. *Presented by M. Georg Monflier.*

Nansen. **Monflier and Toutain.**

Les grandes journées de la Société Normande de Géographie. Le Docteur Fridtjof Nansen à Rouen. Souvenir de sa réception à la Société Normande de Géographie le 30 Mars 1897. Par G. Monflier. Avec une Notice biographique par Paul Toutain. Rouen, 1897. Size 8½ × 5½, pp. 86. *Illustrations. Presented by the Author.*

GENERAL.

Bibliography. **Raveneau.**

Annales de Géographie. XII^{e} Bibliographie Géographique Annuelle 1902. Publiée sous la direction de L. Raveneau. Paris: A. Colin, 1903. Size 10 × 6½, pp. 320.

Descriptive Geography. *Vierteljahrshefte G. Unterricht* 2 (1903): 191–203. **Ratzel.**

Die Naturschilderung in der Geographie. Von F. Ratzel.

Dictionary. **Chandra Das, Sandberg, and Heyde.**

A Tibetan English Dictionary with Sanskrit Synonyms: by Sarat Chandra Das. Revised and Edited under the orders of the Government of Bengal, by Graham Sandberg and A. William Heyde. Calcutta: The Bengal Secretariat Book Depôt, 1902. Size 11 × 9, xxxiv. and 1354. *Presented by the Bengal Government.*

Educational. ——

Royal Geographical Society. Syllabuses of Instruction in Geography. I. In Elementary Schools. II. In Higher Schools. The Royal Geographical Society, 1903. Size 10 × 6½, pp. 18.

See note in the Monthly Record.

Educational Exhibition. *Vierteljahrshefte G. Unterricht* 2 (1903): 210–234. **Trampler.**

Die geographische Abteilung der österreichischen Lehrmittelausstellung. Von R. Trampler.

French Geographical Congress. **Monflier.**

Société Normande de Géographie. Le Congrès National des Sociétés Françaises de Géographie en 1903 à Rouen. Son Organisation. Par G. Monflier. Rouen, 1903. Size 8½ × 5½, pp. 142. *Presented by the Author.*

German Colonies. *Beiträge Kolonialpolitik* 4 (1902-1903): 193-198. **Singer.**

Kartographische Arbeiten über die deutschen Schutzgebiete. Von H. Singer.

German Colonies. **Zimmermann.**

Die deutsche Kolonial-Gesetzgebung. Dritter Theil, 1897 bis 1898. (Pp. vi. and 172).—Vierter Theil, 1898 bis 1899. (Pp. xiv. and 238).—Fünfter Theil. 1899 bis 1900. (Pp. xlii., 224, and xxxiv.) Auf Grund amtlicher Quellen und zum dienstlichen Gebrauch herausgegeben von Dr. A. Zimmermann. Berlin: E. S. Mittler und Sohn, 1899-1901. Size 10 × 6½.

Greifswald Geographical Society. **Credner.**

Zum 20 jährigen Bestehen der Geographischen Exkursionen der Geographischen

Gesellschaft zu Greifswald von deren Leiter Prof. Dr. Rudolf Credner. Greifswald: J. Abel, 1903. Size 9 × 6, pp. 20. *Map. Presented by the Author.*

Livingstone College. ——

Livingstone College Calendar and Year-Book. Containing a Record of a Year's Progress in matters of Health, Outfit, and Travel. Leyton (N.D.). Size 7½ × 5, pp. 96. *Illustrations. Price 6d.*

Medical Geography. **Dyé.**

Renseignements Colon., Comité l'Afrique Française, No. 6 (1903): 149-161.

Les Moustiques et la fièvre jaune. Par L. Dyé.

Medical Geography. **Mosso and Marro.**

Atti R.A. Lincei, Rendiconti **12** (1) (1903): 453-477.

L'acapnia prodotta nell' uomo dalla diminuita pressione barometrica. Nota del A. Mosso e del dott. G. Marro. *With Illustrations.*

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Le variazioni che succedono nei gas del sangue sulla vetta del Monte Rosa. By the same. *With Diagram.*

Military Education. *Suppl. J. United Service I. India* **32** (1903): pp. 188. ——

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Map of the County of the City of Glasgow and the Vicinity. Compiled from actual survey. A. B. McDonald, M.I.C.E., City Engineer. Scale 440 feet to an inch. Edinburgh: John Bartholomew & Co., 1902. *Presented by A. B. McDonald, Esq., M.I.C.E.*

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Sheets: (Preliminary Edition) 62 and 96 (New Series), district Upper Chindwin, Season 1894–97, 1902–03; (Second Edition) 109, districts Minbu, Myingyan and Pakôkku, Seasons 1891–92, 1895–96, and 1897–98, 1902; (Preliminary Edition) 186 and 187 (New Series), district Katha, Season 1895–98, 1902; 236 (New Series), parts of districts Shwebo, Ruby Mines, Katha, and Northern Shan States, Season 1900–01, 1902; 239 (New Series), parts of districts Shwebo, Ruby Mines, Mandalay, and Hsi Paw (Northern Shan States), Season 1899–1900, 1902; (Preliminary Edition) 290 (New Series), parts of districts Mandalay and Kyaukse and of Southern Shan States, Season 1899–1900, 1901; (Preliminary Edition) 297 (New Series), parts of district Yamethin, the Myelat, and Southern Shan States, Season 1896–97, 1901; (Preliminary Edition) 335 and 336 (New Series), Southern Shan States, Season 1899–1900, 1901; 432 (New Series), parts of Northern Shan States, Season 1900–01, 1902; (Preliminary Edition) 469, 529 and 530 (New Series), district Tavoy, Seasons 1891–93, 1902; 506 (New Series), parts of Northern and Southern Shan States, Season 1900–01, 1902.—China Field Force Survey, 2 miles to an inch. Sheets: 10, 11 and 14, China, Chih-Li Province, Season 1900–01, 1902.—Madras Survey, 1 mile to an inch. Sheets: 53, part of district Mysore (Mysore), Season 1884–85, 1902; 78, part of district Mysore, Seasons 1876–78, 1901; 110, parts of district Mysore (Mysore) and Coimbatore (Madras), Season 1884–85, 1902; 138, parts of districts Bangalore and Kolar (Mysore), Seasons 1876–78, 1902; 139, parts of districts Bangalore and Kolar (Mysore), and Salem (Madras), Seasons 1877–80, 1902; 202, part of district Kolar (Mysore), Seasons 1885–86, 1902.—North-Eastern Frontier, 4 miles to an inch. Sheets: 22 N.E., China, Yünnan Province, Season 1899–1900, 1903; (Third Edition) 22 S.W., parts of Singpho Naga Hills and the Upper Irawadi and Chindwin valleys (Upper Burma), Seasons 1887–92 and 1895–96, 1902; 22 S.E. and 23 N.E., S.E., Burma and China, Yünnan Province, Seasons 1894–97 and 1899–1900, 1902; 28 S.W., S.E., 29 N.W., N.E., S.E., 30 S.E., 37 N.W., N.E., S.W., China, Se-chuan Province, Seasons 1897–1901, 1902; 29 S.W., China, Yunnan and Se-chuan Provinces, Season 1899–1900, 1902; 30 S.W., 31 N.W., S.W., S.E., 39 S.W., China, Yunnan Province, Seasons 1898–1900, 1902; 38 N.W., S.W., China, Sse-chuan and Kuei-chou Provinces, Season 1898–99, 1902.—South-Eastern Frontier, 4 miles to an inch. Sheets: (Fifth Edition) 1 S.E., parts of Upper and Lower Chindwin, Pakokku, Shwebo, Mandalay, and Sagaing districts and Chin Hills (Upper Burma), Seasons 1886–91, 1902; (Seventh Edition) 2 N.E., Upper Burma, parts of districts Lower Chindwin, Sagaing, Minbu, Myingyan, Pakokku, Meiktila, Kyaukse, and Chin Hills, Seasons 1886–90 and 1897, 1902; (Fifth Edition) 5 N.W.,

parts of districts Mandalay, Sagaing, Meiktila, Kyauksè, and Myingyan, and of the Shan States, Seasons 1889-94 and 1897-1901, 1902; 12 S.E., S.W., 20 N.W., China, Yünnan Province, Seasons 1894-95, 1898-1900, 1902.—North-Western Provinces and Oudh Survey, 1 mile to an inch. Sheets: (Preliminary Edition) 69, 84, 99, district Sháhjahánpur, Seasons 1895-97, 1902.—Sind Survey, 1 mile to an inch. Sheets: 10, districts Karachi and Lárkhána, Season 1900-01, 1902; 11, 13, 14, district Karachi, Seasons 1896-97, 1900-01, 1902.—United Provinces of Agra and Oudh and Bengal Surveys, 1 mile to an inch. Sheets: (Second Edition) 204 (U.P.A. and O.), 28 (Bengal), parts of districts Gorakhpur (U.P.A. and O.) and Champáran (Bengal), Seasons 1886-87 and 1895-96, 1902; (Second Edition) 206 (U.P.A. and O.), 29 (Bengal), districts Gorakhpur (U.P.A. and O.) and Saran (Bengal), Seasons 1883-87 and 1893-94, 1902; (Second Edition) 216 (U.P.A. and O.), 54 (Bengal), parts of districts Gorakhpur and Saran, Seasons 1883-84 and 1893-96, 1902; (Second Edition) 321 (Punjab), 8 (U.P.A. and O.), districts Delhi, Gurgaon, Rohtak (Punjab), Meerut and Bulandshahr (U.P.A. and O.), Seasons 1872-77 and 1881-82, 1902.—Assam, district Darrang, 8 miles to an inch, 1902.—Bengal, district Burdwan, 8 miles to an inch, corrected up to 1901, 1902; Chittagong, 8 miles to an inch, corrected up to 1901, 1902; Cuttack, 8 miles to an inch, corrected up to 1901, 1902; Dacca, 8 miles to an inch, corrected up to 1901, 1902; Malda, 8 miles to an inch, corrected up to 1901, 1902.—United Provinces of Agra and Oudh, districts Ballia, 8 miles to an inch, corrected up to 1902; Bánda, 8 miles to an inch, corrected up to 1902; Benares, 8 miles to an inch, corrected up to 1901, 1903; Bijnor, 8 miles to an inch, corrected up to 1901, 1903; Cawnpore, 8 miles to an inch, corrected up to 1901, 1902; Fatehpur, 8 miles to an inch, corrected up to 1901, 1903; Ghazipur, 8 miles to an inch, corrected up to 1901; Mirzapur, 12 miles to an inch, corrected up to 1902.—Korea, Tributary State of Chota Nagpur, 8 miles to an inch, 1902.—Chart of Triangulation, No. 20 party (Burma Forest), 2 miles to an inch. Sheets: 161, 207, 208 (Burma), (New Series), Seasons 1868-69, 1875-76, and 1883-89, and 1891-92, 1902.—Preliminary Chart of the Secondary Triangulation of the Manipur Minor Meridional Series, No. 2 and 3, 4 miles to an inch, Seasons 1900-03.—Index to the Standard Sheets of Central India and Rajputana, 1901.—Index to the Standard Sheets of the North-East and South-East Frontier Series.—Index to the Standard Sheets of the Punjab and North-West Frontier Province, 1902.—Index to the Standard Sheets of H.H. the Nizam's dominions and assigned districts of Berar, 1901. *Presented by H.M. Secretary of State for India, through the India Office.*

Indo-China. **Sérvice Géographique de l'Indo-Chine.**

Carte de l'Indo-Chine. Scale 1:100,000 or 1·6 stat. mile to an inch. Sheets: Hone-Cohe, Nha-Trang, Cam-Linh, Quang-Tri, M'Sao, Da R'Lao, Dan-Kia, Dan-Kia (ouest), Djirinh, Mi-Pou, Tam-Linh, Phu-Dien, Ha-Tinh, Huong-Khe, Vinh, Ron, Dong-Hoi, Phu-Tinh-Gia, Quang-Fri (est). Sérvice Géographique de l'Indo-Chine, 1902-3. *Price* $0·60 *each sheet.*

Peking to Tientsin. **Sérvice Géographique de l'Indo-Chine.**

Region de Tien-Tsin à Pékin. Scale 1 : 500,000 or 7·8 stat. miles to an inch.—Tien-Tsin. Scale 1 : 100,000 or 1·6 stat. miles to an inch. Sérvice Géographique de l'Indo-Chine, 1900.

AFRICA.

Africa. **Intelligence Division, War Office.**

Africa. Scale 1 : 1,000,000 or 15·8 stat. miles to an inch. Sheets: 79, South Abyssinia; 87, Boran. *Price* 2*s. each.* Scale 1 : 250,000 or 3·9 stat. miles to an inch. (Provisional) Sheet 46-I, Khor Langeb. Egyptian Sudan. *Price* 1*s.* 6*d.* London: Intelligence Division, War Office, Stanford, 1903. *Presented by the Director-General of Mobilization and Military Intelligence.*

Africa. **Philip.**

Philip's Comparative Series of large School-maps. Africa. Scale 1 : 6,000,000 or 95 stat. miles to an inch. London: George Philip & Son, Ltd. *Price* 16*s. mounted on rollers and varnished. Presented by the Publishers.*

There are two editions of this school wall-map, one showing physical features only, and the other the same with the more important names added. It is orographically coloured, land between sea-level and 600 feet in latitude being shown by dark green, from 600 to 1200 feet light green, from 1200 to 3000 light brown, and land above 3000 feet darker brown. In addition to the tinting, the general relief is indicated by vertical hachures. Boundaries are shown by red lines, and towns by symbols in red, varying in form according to importance and population. Water is blue, a paler

tint of which colour indicates the depths of less than 100 fathoms. A small inst
the British Isles on the same scale as the general map is given for comparison of ar
as well as a political map of Africa on one-fourth of the scale. It is to be regrett
that the orographical colouring has not been confined to different tints of brow
instead of employing green to represent the land of lower altitude.

East Africa. **Wickenb**

Graf Eduard Wickenburg's Reiserouten in Ost-Afrika 1901. Scale: 1 : 1,000,00
or 15·8 stat. miles to an inch. 3 sheets. *Petermanns Geographische Mitteilunge*
Jahrgang 1903. Taf. 16, 17, 18. Gotha: Justus Perthes. *Presented by th*
Publisher.

Egypt. **Public Works Department, Cai**

Egypt.—Behera Province, scale 1 : 50,000 or 0·78 stat. mile to an inch, Sheet
14. Girga Province, scale 1 : 25,000 or 0·39 stat. mile to an inch, Sheets 7, 8
and 10. Gharbia Province, scale 1 : 10,000 or 0·15 stat. mile to an inch, Sheets
30–9, 30–10, 31–9, and 31–10 N.E. Cairo: Public Works Department, Survey
Department. *Presented by the Director-General of the Survey Department, Cairo.*

The Egyptian Survey Department, under the superintendence of Captain H. G. Lyo
R.E., is doing most excellent work, as is evidenced by the above survey sheets, whi
have recently been presented to the Map Room of the Society. The Behera sheet,
the scale of 1 : 50,000, forms part of a large map of Egypt now in course of preparatio
the remainder are sheets of maps of separate provinces on the scale of 1 : 10,0
1 : 25,000, and 1 : 50,000. In most cases the lettering is in Arabic and English. T
maps are clearly printed in colours, which have been well chosen.

Katanga. **Droogman**

Carte du Katanga (territoires gérés par le Comité Special du Katanga). Dressée
par H. Droogmans. Scale 1 : 1,000,000 or 15·8 stat. miles to an inch. 2 sheets.
Brussels, 1903. *Presented by M. Hubert Droogmans.*

This map embraces the region to the west of Tanganyika and Bangweulu as f
as the Sunkuru river, and between latitudes 4° 30′ and 14° S. The work of Captai
Lemaire has been utilized in the compilation, but the recent route surveys of Mr. C
Grey have not been taken full advantage of. Until more exact surveys have been carrie
out, the greater number of the positions must be considered as extremely approximate

Spanish Guinea. **d'Almont**

Muni. Guinea Continental Española. Por Enrique d'Almonte. Scale 1 : 200,000
or 3·15 stat. miles to an inch. Vocal da la Comisaria Regia de España en el
Africa Occidental. Publicado de Real Orden por el Ministerio de Estado. Madrid,
1903. 2 sheets. Supplement to the *Boletin de la Real Sociedad Geográfica*,
Madrid, vol. xliv.

The Spanish West African possession of Muni is situated on the coast betwee
the French Congo and German Kamerun regions. It is but very imperfectly explore
and such maps as exist have been drawn from rough route sketches. The prese
map is certainly the most complete that has hitherto been published, but eve
here many districts are left blank or roughly sketched in. The coast-line has bee
taken from the British Admiralty Charts and other hydrographical surveys, and th
interior of the map is drawn from the route-surveys of numerous travellers, includin
those of the late M. P. du Chaillu.

AMERICA.

Argentine Republic. **Ministerio de Obras Pública**

Mapa de los Ferro Carriles de la República Argentina. Año 1901. Scale
1 : 2,000,000 or 31·5 stat. miles to an inch. 2 sheets. [Buenos Aires]: Ministerio
de Obras Públicas.

An outline map of the Argentine Republic, printed in colours, without hillwork
showing railways up to 1901. There are six inset plans of towns on enlarged scales.

Canada. **Almon and Spence**

Map showing the Railways of Canada, to accompany the Annual Report on
Railway Statistics, 1903. Scale 1 : 2,724,480 or 43 stat. miles to an inch.
Compiled and drawn by A. U. Almon under the supervision of J. B. Spence, C.E.,
Chief Draftsman, Department of Railways and Canals, Canada. 3 sheets. *Presented
by the High Commissioner for Canada.*

Shows clearly, in red, railways in operation and under construction up to January 1
of the present year. Each line bears a number, corresponding to a similar number
in an index, from which the name can be found, which system prevents overcrowding

on the map itself. No hillwork has been attempted. Apart from the special object for which the map has been published, it will be useful for general reference, owing to the large scale upon which it has been drawn, and the amount of detail given.

Canada. **Surveyor-General's Office, Ottawa.**

Sectional Map of Canada. Scale 1 : 190,080 or 3 stat. miles to an inch. Regina Sheet (43), West of Second Meridian; revised to May 8, 1903. Spillimacheen Sheet (89), West of Fifth Meridian; revised to June 24, 1903. Sicamous Sheet (91), West of Sixth Meridian; revised to June 4, 1903. Lytton Sheet (94), West of Sixth Meridian; revised to June 24, 1903. Ottawa: Surveyor-General's Office, 1903. *Presented by the Surveyor-General of Canada.*

These are new editions, revised up to May and June of this year. They are especially important sheets, inasmuch as they are in the vicinity of the Canadian Pacific railway. No. 91 (Sicamous) shows the line from the Illecillewaet river to below Shuswap.

Canada. **Canadian Emigration Department**

Map of the Dominion of Canada, 1903. Scale 1 : 3,674,880 or 58 stat. miles to an inch. Issued by direction of Hon. Clifford Sifton, Minister of the Interior. From latest information furnished by James White, F.R.G.S., Geographer, Department of the Interior, Canada. Ottawa, 1903. *Presented by the Canadian Emigration Department.*

This is a general map of Canada, prepared for general distribution amongst intending emigrants and others who may be thinking of settling in the Dominion. Recent survey work and reproduction of photographs of public buildings, farms, and useful statistical tables are given in the spare spaces upon the map.

GENERAL.

World. **Darbishire and Stanford.**

Map of the World, on an Equal Area Projection, showing Britain and all the British Dominions beyond the Seas. Oxford: Darbishire & Stanford. *Price* 6*d*. *Presented by the Publishers.*

This is a small general outline map of the world on Mollweide's Equal Area Elliptical Projection, by which the relative areas of countries are maintained, thus giving a far more truthful representation of their proportion to another than Mercator's, which is most misleading in this respect. The British Dominions are coloured red, the rest of the map being in black. The map measures about 9 inches by 18, and a square inch on any part represents 1,600,000 square miles. It is satisfactory to find that an attempt is being made in this country to produce educational maps of the world upon this projection, which, whenever the question of relative areas of different regions is concerned, can be recommended for showing the world as a whole. The drawback is that towards the limits of the maps the countries are distorted as to form and configuration.

World. **Darbishire and Stanford.**

The Autograph Hand-maps. A new series of penny outline maps. British Isles, scale 1: 2,750,000 or 43·4 stat. miles to an inch; England and Wales, scale 1: 2,000,000 or 31·5 stat. miles to an inch; Scotland, Scale 1; 1,500,000 or 23·6 stat. miles to an inch; Ireland, scale 1 : 1,500,000 or 23·6 stat. miles to an inch; Europe, scale 1; 20,000,000 or 315·6 stat. miles to an inch; Africa, scale 1 : 30,000,000 or 473·4 stat. miles to an inch; North America, scale 1 : 30,000,000 or 473·4 stat. miles to an inch; South America, scale 1 : 30,000,000 or 473·4 stat. miles to an inch; Australasia, scale 1: 30,000,000 or 473·4 stat. miles to an inch; Greece, Scale 1 : 1,500,000 or 23·6 stat. miles to an inch; Italy, scale 1 : 4,000,000 or 63·1 stat. miles to an inch; The Netherlands, scale 1: 2,000,000 or 31·5 stat. miles to an inch; Central Europe, scale 1 : 7,500,000 or 118·3 stat. miles to an inch; the Danube Lands, scale 1 : 5,000,000 or 78·9 stat. miles to an inch; The Nearer East, scale 1 : 15,000,000 or 236·7 stat. miles to an inch; the Mediterranean Region, scale 1: 12,000,000 or 189·4 stat. miles to an inch. Oxford : Darbishire & Stanford. *Presented by the Publishers.*

A series of small outline maps without names, on various scales, showing the general configuration of the land by dull brown shading. They have been carefully drawn, and are so arranged that additional matter, such as geological features, distribution of population, etc., can be coloured upon them.

World. **Philip.**

Philip's "Diagram" Hand Atlas. Designed by B. B. Dickinson, M.A., F.R.G.S., and A. W. Andrews, M.A., F.R.G.S. London: George Philip & Son, Ltd. *Price 3s. net. Presented by the Publishers.*

These are the orographically coloured "Diagram" Hand Maps by Messrs. Dickinson and Andrews which have been noticed from time to time in the *Geographical Journal* as they have appeared. They are now brought together in atlas form, in which they will be doubtless found useful.

World. **Philip.**

Philip's London School Board Atlas. A series of 44 coloured plates, containing over 98 maps and plans, printed in colours, and 8 pages of introductory letterpress. Edited by George Philip, F.R.G.S. *Price* 1s. 3d. *net.*—Philip's Atlas of Comparative Geography for Junior Classes. A series of 40 coloured plates, containing over 90 maps and diagrams, with 8 pages of introductory letterpress and index. Edited by George Philip, F.R.G.S.—Philip's Sixpenny Atlas of Comparative Geography. Edited by George Philip, F.R.G.S. London: George Philip & Son, Ltd. *Presented by the Publishers.*

These are all published with a view of supplying the present demand, which, it is satisfactory to note, has been increasing of late, for cheap school atlases prepared in accordance with the more enlightened methods of geographical education. In all of them attention has been specially given to the representation of the physical features, and orographically coloured maps hold a prominent place. Their extremely moderate price will bring them within the reach of all.

World. **Stieler.**

Neue, neunte Lieferungs-Ausgabe von Stielers Hand-Atlas, 100 Karten in Kupferstich, 21 and 22 Lieferung. Gotha: Justus Perthes. *Price 60 pf. each part.*

These two parts, which are in one cover, consist of the following sheets: No. 26, France, General, by C. Vogel, 1:3,700,000. No. 31, Spain and Portugal, by C. Vogel, 1:3,700,000. Nos. 44 and 45, Russia, sheets 1 and 2, 1:3,700,000, by H. Kehnert and H. Habenicht. The sheets of France and Spain are revisions, but those of Russia are entirely new.

CHARTS.

Admiralty Charts. **Hydrographic Department, Admiralty.**

Charts and Plans published by the Hydrographic Department, Admiralty, during July and August, 1903. *Presented by the Hydrographic Department, Admiralty.*

No.	Inches.	
1859 m =	4·6	England, west coast:—King road. 1s. 6d.
3337 m =	6·9	England, east coast. River Thames:—London Bridge to Woolwich. 2s. 6d.
1471 m =	20·8	Ireland, east coast:—Kingstown harbour. 1s. 6d.
3345 m =	4·0	France, north-west coast:—Chenal du Four. 2s. 6d.
3342 m =	8·0 6·0	Greece. Port Kaio:—Githion. 1s. 6d.
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3376 m =	2·9 9·0	Plans on the north coast of South America:—Approaches to Guanta harbour. Guanta harbour. 1s. 6d.
3318 m =	0·05	South America, west coast:—St. Elena point to Gulf of Dulce. 2s. 6d.
3327 m =	0·24	Mexico, south-west coast:—Cape San Lucas to Espirito Santo and Sta. Margarita Island. 2s. 6d.
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3334 m =	0·16	Japan, Nipon island, east coast. Tokyo to Sendai bay. 2s. 6d.
2655 m =	3·1	Nipon, south coast:—Approaches to Shimoda harbour. 1s. 6d.
1945 m =	3·9	Nipon, Kii channel:—Tanabe Wan. 1s. 6d.
3375 m =	7·0 4·0	Plans on the south coast of Japan. Hososhima Ko. Shimizu Ko. 1s. 6d.

288 m = $\left\{\begin{matrix}1·3\\2·8\end{matrix}\right\}$ Russian Tartary:—Ussuri bay. (Plan: Andriva bay.) 2*s.* 6*d.*
3332 m = 0·5 New Zealand, North island, east coast:—Mercury bay to Town point. 2*s.* 6*d.*
479 West Indies. Anchorages in Puerto Rico island. Plan added:—Port Arecibo.
632 Walfisch bay to Orange river. New plan:—Possession Road.
2597 China sea. Banke strait. Plan added:—Muntok road.
1622 Ports in the Philippine islands. Plan added:—Parasan harbour and approaches.
3216 Japan. Plans on the east coast of Nipon island. Plans added:—Oginohama ko. Hirota wan.
357 Japan. Harbours in Kii channel. New plan:—Osaki bay.

(*J. D. Potter, Agent.*)

Charts Cancelled.

No.		Cancelled by	No.
1859	King road.	New plan. King road	1859
1471	Kingstown harbour.	New plan. Kingstown harbour	1471
1685	Gythium. Plan on this sheet.	New plan. Port Kaio. Githion (Gythium)	3342
479	Mayaguez bay. Plan on this sheet.	New plan. Mayaguez bay	3373
478	Port San Juan. Port Arecibo.	New plan. Port San Juan	478
1528	Ports and anchorages on the north coast of South America. Plan of Guanta harbour on this sheet.	New plan. Guanta harbour	3376
632	Walfisch bay to Orange river. Plan of Elizabeth bay on this sheet.	New plan. Possession road	632
2655	Simoda harbour.	New plan. Approaches to Shimoda harbour	2655
357	Harbours in the Kii channel. Plan of bay of Tanabé on this sheet.	New plan. Tanabe wan	1945

Charts that have received Important Corrections.

No. 3038, Norway:—Biörnsud to Kristiansund. 2274, White sea, sheet vi.:—Kamennoi point and Unshaya inlet, etc. 2276, White sea, sheet viii.:—Buin point to Sharapov head. 2970, Novaya Zemlya:—Sukhoi Nos to north Gusini Nos. 3035, Plans in Novaya Zemlya. 1461, Italy:—Genoa. 280, Newfoundland:—Notre Dame bay. 314, North America:—River St. Lawrence, Orignaux point to Goose island. 519, North American lakes:—Lake Huron. 853, United States, east coast:—St. Andrew sound to St. John's river. 1911, United States, west coast:—Approach to Juan de Fuca strait. 634, British Columbia:—Port Harvey. 40, India, west coast:—Karáchi harbour. 2149, Eastern archipelago:—Banka strait. 942B, Eastern archipelago, eastern portion. 999, Siam:—Bangkok river. 1459, China, east coast:—Hongkong harbour. 1602, China:—Approaches to the Yang-tse-kiang. 861, Russian Tartary:—River Amur, sheet i. 862, Russian Tartary:—River Amur, sheet ii. 2119, Australia, east coast:—Newcastle harbour. 764, Pacific (western):—New Hanover, New Ireland, and New Britain. 1423, New Zealand:—Port Nicholson.

(*J. D. Potter, Agent.*)

North Atlantic Ocean and Mediterranean Sea. **Meteorological Office.**

Pilot Chart of the North Atlantic and Mediterranean for September and October, 1903. London: Meteorological Office. *Price* 6*d.* *Presented by the Meteorological Office, London.*

United States Charts. **United States Hydrographic Office.**

Pilot Chart of the North Atlantic for August and September, and of the North Pacific for September and October, 1903. U.S. Hydrographic Office, Washington, D.C. *Presented by the U.S. Hydrographic Office.*

PHOTOGRAPHS.

Abyssinia. **Hindlip.**

Sixty-three Photographs of Abyssinia, taken by Lord Hindlip. *Presented by Lord Hindlip.*

Many of these photographs serve well to illustrate the natives and character of the country through which Lord Hindlip travelled, and the subjects are well selected.

(1) The expedition's camp in the Oderali country; (2) Bridge over Hawash river, south of Addis Abeba, built by Indian workmen; (3) Two of Lord Hindlip's Somalis; (4) Four of Lord Hindlip's Abyssinian mule-men; (5) Native bridge over a tributary of the Katara river; (6) Gallas at Sidamo; (7) Jibouti; (8) Jibouti railway; (9) Lord Hindlip and two of his boys; (10) Polo at Addis Abeba; (11) Lepers, south-west of Lake Zwai; (12) Mr. F. W. Whitehouse and two boys; (13 and 37) Oderali women; (14) Abyssinian priests begging at British agency; (15) Tree bridge north-east of Lake Margherita; (16) A river-bed; (17) Crossing a dry river, Gugune country; (18) Market-place at Wessa; (19) Five of Lord Hindlip's Abyssinians; (20) The caravan in the bush; (21) A zebra; (22) Entrance to bridge over Hawash river, south of Addis Abeba, made by Indians; (24) The kitchen of the expedition; (25) Gallas hunting; (26) The cook box; (27) Shelter made of camel mats; (28) Rush path over swamp joining two parts of Lake Abasso; (29) Lord Hindlip and dog; (30) Track near Errer, north of Addis Abeba; (31) Colonel Harrington at Addis Abeba; (32) Camp in the Danakil country; (33) Gallas, south-west of Lake Zwai; (34) Galla watch-hut in tree, used by natives to watch their crops; (35) A tributary of the Margherita; (36) Crossing a river; (38) Camp at Ghobe; (39) The Hawash river; (40 and 41) Galla chief, south-west of Lake Zwai; (42) Abyssinian huts at Balghi; (43) Oderali natives; (44) Oderali camels shifting village; (45) British agency, Addis Abeba; (46) Colonel Harrington and Captain Duff; (47) Harar; (48) Colonel Harrington's escort; (49) Maki river; (50) Track east of Lake Margherita; (51 and 52) Katara river; (53 and 54) Crossing Katara river; (55) Track south-east of Lake Zwai; (56) Crossing a corner of Lake Zwai; (57) Islands in Lake Zwai; (58) Gallas; (59) Zwai Galla women; (60) Zwai Gallas; (61) Gallas east of Lake Zwai; (62 and 63) Gallas west of Lake Zwai.

Argentine Republic. ———

Photograph of the Magnetic and Meteorological Observatory on the Island of Ano Nuevo. *Presented by the Ministerio de Marina, Republica Argentina.*

Burma. **Sternberg.**

Twenty-six Photographs of Burma, taken by F. R. Sternberg, Esq. *Presented by F. R. Sternberg, Esq.*

These form a welcome addition to the photographs which Mr. F. Sternberg has previously presented to the Society, of regions he has visited. They are a remarkably clear little set, principally of river scenery and pagodas.

(1) Group of Shans returning from a pilgrimage; (2) Shive Dagon pagoda, Rangoon; (3) Buddhist priest at morning prayer; (4) Morning devotions, Shive Dagon pagoda, Rangoon; (5 and 6) Chapels and altars in the Shive Dagon pagoda; (7) A quiet smoke; (8) Moat, bridge, tower, and wall, Mandalay; (9) Entrance to ex-king Theebaw's palace, Mandalay; (10) Summer-house in garden of palace; (11) The queen's apartments; (12) My dormitory, Upper Burma club; (13) The Centre of the Universe, Mandalay; (14) General view of the 450 pagodas, Mandalay; (15) One of the 450 pagodas; (46) Engraved stone, with Sanscrit inscription of one of the Holy Books of Buddhism under one of the 450 pagodas, Mandalay; (17) Irawadi Company's steamer *Beeloo*, with a flat on either side; (18) Indian steersman and Burmese pilot on the steamer *Beeloo;* (19 and 20) Native passengers on the steamer *Beeloo;* (21) Rice-boat on the river Irawadi; (22) Rice-boat on the river Irawadi, showing carved stern; (23) Fort Minbla; (24) Tenangyat, on the Irawadi; (25) Burmese passengers coming off the steamer in a dugout; (26) Shivesandaw pagoda, Prome.

N.B.—It would greatly add to the value of the collection of Photographs which has been established in the Map Room, if all the Fellows of the Society who have taken photographs during their travels, would forward copies of them to the Map Curator, by whom they will be acknowledged. Should the donor have purchased the photographs, it will be useful for reference if the name of the photographer and his address are given.

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FRESH-WATER LOCHS OF SCOTLAND.

PLATE I.—LOCH TUMMEL.

MURRAY AND PULLAR.

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RESH-WATER LOCHS OF

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SCOTLAND.

PLATE II.—LOCH TAY.

MURRAY AND PULLAR.

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UNIVERSITY

ESH-WATER LOCHS OF
SCOTLAND.

FRESH-WATER LOCHS OF SCOTLAND.

PLATE III.—LOCH TAY.

MURRAY AND PULLAR.

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UNIVERSITY

RESH-WATER LOCHS OF
SCOTLAND.

PLATE IV.—LOCHS DERCULICH, SCOLY, ORDIE,
NA CRAIGE AND KENNARD,
SKIACH.

MURRAY AND PULLAR.

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FRESH-WATER LOCHS OF SCOTLAND.

PLATE V.—LOCHS BROOM, ESSAN, LOCHANS BREACLAICH, NA LAIRIGE, LOCHS DAIMH AND GIORRA.

MURRAY AND PULLAR.

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The

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EXPEDITION TO CAUPOLICAN BOLIVIA, 1901-1902.*

By Dr. JOHN WILLIAM EVANS.

I left Southampton on June 26, 1901, in charge of an expedition despatched by Sir Martin Conway to explore the district of Caupolican and the adjoining region to the north-east of the Andes of northern Bolivia. The *personale* of the party consisted of, besides myself, Mr. Gerard N. Watney, civil engineer and surveyor; Mr. John Turle, of the Redruth College; and Mr. R. S. Williams, of the New York Botanical Gardens, Bronx Park, New York City. Many of the surveying and meteorological instruments that we took with us were lent by the Society.

We arrived in La Paz on August 13, and were furnished by the Government with letters of introduction to the officials in the region we were to visit, and other facilities. We left again on the 26th for Sorata, which we reached three days later.

There are two principal routes from Sorata across the Cordillera. One, by Tipuani, follows a transverse valley which commences immediately to the north-west of Illampu and runs north-eastward to Huanay,† at the confluence of the river Tipuani with the Mapiri. The other, which we took on this occasion, lies further to the north-west, and skirts the great Sorata-Mapiri transverse valley for some distance.

We left Sorata on September 8, and ascended the Ticunhaya spur, on the foot of which the town stands, to the point where the tracks diverge—to Tipuani and Huanay on the right, and to Puerto Mapiri and we passed several small farms where crops are grown to supply the rubber-collectors in the valleys below. They also serve as sanatoria, for they are comparatively cool, and, in the matter of health, all that could be desired. From one of these, known as Villa Bella, a side track runs off to Tipuani, but it was said to be in a bad condition. From the last hill a rapid descent and a short journey through tropical vegetation brought us to Puerto Mapiri (1610 feet M.C.),* on the right bank of the river of the same name. This village consists of a number of huts constructed of a framework of unhewn timber, with walls filled in with small poles about half an inch apart, so as to leave a free current of air. The largest huts are used as storehouses for the merchandise, which is here transferred from mules to rafts and *vice versá.*

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* Read at the Royal Geographical Society, June 22, 1903. Map, p. 724.

† Or Guanay. Indian place-names are spelt in this paper in accordance with Spanish orthography; *hu* is sounded like *w*, and *gu* before *a* and *o* has usually the same sound.

A stay either at Mapiri or Charopampa, at the other side of the river, of more than a few hours is apt to result in an attack of malaria. At the latter, where we stayed, I noticed the presence of *anopheles,* the mosquito which has been shown to act as carrier of the *plasmodium malariæ.* Although the connection between the mosquito and the disease is still disbelieved by the Bolivians, it has long been an article of faith among the Indians of the low country. The Aimará Indians who undertook the transport of our stores from Sorata to Mapiri were quite aware that it was dangerous to spend the night in a malarious locality, and insisted on stopping in the afternoon at La Vacqueria, one of the last hills, so that they could descend to the village early in the morning and return to their camp before nightfall.

The Indians who form the crews of the rafts belong to the Leco race, entirely distinct in language, character, and features from the Aimarás of the Cordillera. Most of them live near Huanay, but they also constitute the population of Aten.†

We left Charopampa with part of our stores on two *callapos* (pr. kaiyápos), a name applied to a combination of two or three small rafts, or "*balsas,*" on September 26, and, camping one night on a river-beach or *playa,* reached Huanay early the next day. At Mapiri the hills of slate and subrecent conglomerate leave a considerable extent of lower ground near the river, but further on they soon close in, and the stream runs in a narrow uninhabited valley till Huanay is approached, when it opens out again, and small plantations and huts are seen from time to time by the river-side. The hills on both sides are exploited for india-rubber.

Huanay ‡ stands on the right bank of the river, on the alluvial land just above the mouth of the Rio Tipuani. It is the centre of the river navigation, the port for the Tipuani route across the Cordillera, and an the metamorphosed rocks give place to slates. These soon show signs of decomposition, weathering in bands to a red lateritic clay, and before long the whole mass of the slates has passed into laterite. In this soft material the traffic has worn a deep channel, so narrow that it is often difficult or impossible for a loaded mule to pass. Beds of alluvial gravel are now frequently met with high up above the river, and sometimes form considerable cliffs. In former times auriferous layers interstratified in these deposits were extensively worked. A little further on the track gains the grassy heights of Paniaula (3415 feet), from which magnificent views are obtained. A long descent to the river follows, and a point is soon reached where the hills recede, leaving a wide and fertile valley; this is followed by a narrow gorge (Encañada de la Cueva), which opens out again as Tipuani (1820 feet M.C.) is approached.

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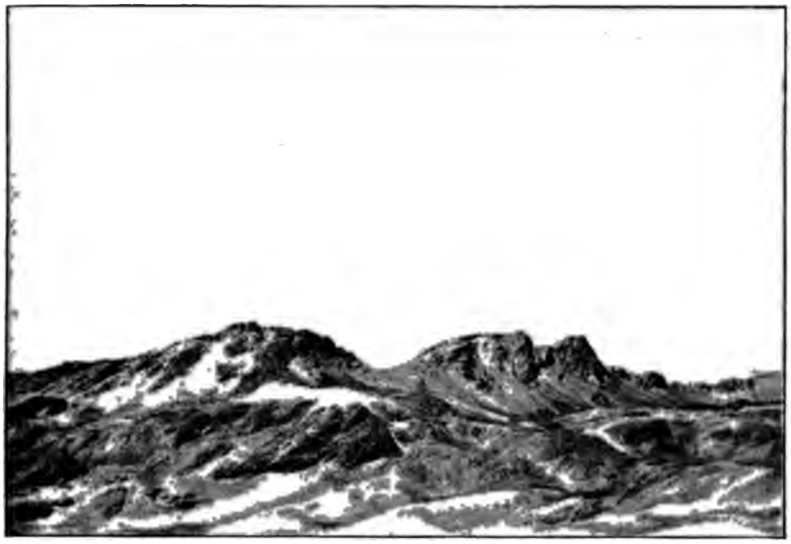
* The site of a mission founded by the Augustins; transferred to the Franciscans in 1796 ((2), p. 111), but since abandoned.

† They are probably identical with the Indians known as Chunchos or Cambas.

‡ 1400 feet M.C.; formerly a Franciscan mission.



FIRST CREST OF CORDILLERA ON TRACK FROM SORATA TO INGENIO.

This once busy mining centre has dwindled to very small proportions. There is no reason to believe that the deposits are worked out, but the difficulty in obtaining clear titles is a serious hindrance to the investment of capital. Only a few huts are now standing, and scant traces remain of the former extent of the place. At some points crumbling mud walls may still be distinguished amidst the tropical vegetation, and elsewhere abandoned machinery is rusting in the forest. Malarial fever is prevalent; the climate is very damp, and a chilly wind blows down the valley at night.

cargoes have been lost in the passage. It is easiest to pass at high water, but even then large stationary waves below the fall break completely over the *balsas*.

A small outcrop of limestone occurs near Nube, a point at which two streams, one on either side, enter the main river, but with this exception the river runs for a long distance entirely through sandstone. At first it is hard and massive, and rises into considerable hills, but these are afterwards replaced by lower elevations of soft sandstone and conglomerate, both of which are usually red in colour and dip at a lower angle. In one of the earliest cliffs presented by the rocks last referred to, rude representations of the sun and moon have been carved, and are supposed to represent Manco Capac and Mama Oello, the founders of the Inca dynasty. The site of some Leco huts in the vicinity is known as Incahuara (*Inca-wara*).*

Hills of the harder sandstone are again met with near Chiniri, or Sañiri, where the river flows in a deep valley. Below, the softer sandstone reappears and continues till the Caca, after repeated convolutions, unites its waters with those of the large river variously known as the Beni, Bopi, and Rio de La Paz. From Retama downwards the river sands are often auriferous, and traces of gold have been also found in the older conglomerates.

The united stream, which takes the name of the Beni,† flows for some distance to the north-west along the margin of hills of soft sandstone which are the foothills of a lofty mountain range stretching like the Cusali ridge north-west and south-east. At last the river turns suddenly to the north-east, and makes its way first through the soft sandstone ridge and then through the higher range, formed of hard sandstone, in the gorge of Beu. At one point this contracts to a narrow chasm with vertical sides, where the water moves slowly in a deep channel.‡ These mountains may be referred to as the Beu range. Some miles of more or less open valley follow till another range is approached, at the foot of which the Rio Chepite or Sepita joins on the left bank. These mountains, conveniently described as the Chepite range, are pierced by a is the most serious complaint. The inhabitants are mainly half-breeds and Indians, the latter being partly Napos,* and partly Tacana-speaking Indians from Tumupasa, Ixiamas and San José. San Buena Ventura was formerly a mission of the Franciscans.

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* We stayed for some time in a grove of a tall bamboo-like grass known as the charo (*Gynerium sagittale*) on the left bank of the river, where it turns sharply to the south just below Maquique (see map). Here a long series of aneroid readings gave an altitude of 1130 feet.

† Beni signifies "wind" in Tacana. The river is also known as Dea Manu (man river), Dia or Dea Beni, Guarayuya (river of the Guarayos), and Rio de los Omapalcas or Amapalcas, (1) pp. 1, 14. Manu (Araona), mayo (Quichua), -apo, -api, -ámonas, -ámanas, -ámas, huára (Leco), para, and yuyo (Pacaguara) all appear to signify "river." Jene (Pacaguara) and ena (Tacana and Cavineña) are similarly used, but properly mean "water."

‡ Just above this point there was a dangerous rapid known as El Beu, Veo, or Cruz Tumsi, caused by large blocks which had fallen into the river-bed, but these obstacles were not apparent when I passed (1) p. 3, (3) p. 19, (10) p. 147.

In June, 1902, I visited Reyes.† It is reached in seven or eight hours' journey through a swampy forest and rather drier pasture country. Goods are mainly transported by means of carts with large solid wheels drawn by four to six bullocks, along a track which has been cleared to a sufficient width. Reyes is situated on one of the areas that rise slightly above the general level, and are known as islands. The population consists mainly of Indians who speak the Maropa language. It is connected by a waggon-track with Santa Anna on the Mamoré. Large herds of cattle graze in the surrounding region. Formerly horses were almost as numerous, but some fifty years ago they were killed off by an infectious disease known as the *peste* that came from Brazil.

BALSA WITH SHELTER, PUERTO MAPIRI.

At San Buena Ventura there was great difficulty in obtaining transport to Tumupasa, consequently the whole party could not travel together. I left on November 23 on foot, with about a dozen Indian porters (*cargadores*), for whose services I was indebted to the kindness of R.P. Fr. Pablo Fernandez of Tumupasa. These men are cheerful and good natured, but have little idea of consulting the convenience of the traveller. Only one of those with me spoke much Spanish, and I found myself put to considerable inconvenience from want of my stores, the carriers of which went on their way independently. The track followed was roughly parallel to the outer slopes of the Bala-Susi mountains.* About 3 or 4 yards wide had been cleared, but this space was often obstructed by fallen trees; portions were rather swampy, but it was on the whole much better than the road to Reyes. Shelters (*tambos*), consisting of a thatched roof supported by substantial upright pieces of timber, but without sides, were provided in two or three places. I crossed numerous streams flowing from the hills to the plain; their beds were filled with sandstone rocks, angular or partially rounded, and continued for some distance into the forest, terminating at the foot of the gentle slope where the low swampy ground is reached, which is under water during the wet season.

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* Probably a local name for Indians from the Manutata (Madre de Dios) and Orton.

† It lies north-east of Rurenabaque. The first site was on an island now known as Pueblo Viejo, on the west side of the Beni, separated from San Buena Ventura by a small branch of the river, (2) p. 39, citing R. P. Francisco Javier Eder.

Tumupasa is situated on the higher part of a slope of this character at about 1435 feet above the sea. Close at the back rise angular hills of friable sandstone, which require some care in climbing, as the rock is treacherous. In front the village looks over the forest of the central Amazonian plain, which at first sight, with its wide uniform expanse and unbroken horizon extending through half a circle at a distance of nearly 40 miles, presents a startling resemblance to the open sea.

Tumupasa is a Franciscan mission, and was founded about the end of the seventeenth century, though the earliest entries in the church register date from 1746, (2) p. 41. Its first site was in the valley of the Yariapo, on the other side of the mountains.† The inhabitants consisted of the Indians from the surrounding country.‡ The locality proved so unhealthy that the mission was moved to the present site, which is remarkable for its freedom from disease and insect plagues. The temperature is low for so small an altitude in the tropics. The rainfall is abundant, but the water soon runs off the surface. The soil in the immediate vicinity of the village is so stony that little can be grown in it, but most of the inhabitants have fertile farms or *chacras* in the lowlands at distances varying from one to six leagues. There are about forty houses, besides a well-built church, belfry standing apart, and a two-storied convent, which is used both as the residence of the missionary and as a school.

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* I use this as a convenient name for the double range of hills immediately southwest of Rurenabaque. Armentia calls it "Ultimo limite de la Serrania," (1) correction to map; President Pando, the "Serrania de Tumupasa," (11) p. 197.

† Its original title was Santissima Trinidad de Yariapo, (5) p. 24. Tumupasa means "white stone."

‡ These were of the Pamaino and Saparuna tribes, (5) p. 6; but Tacanas, Marcanis, Toromonas, Araonas, and Chilliuvos are also represented in the population, (1) p. 5.

A little over 30 miles north of Tumupasa is a somewhat smaller mission—that of Ixiámas *—which was visited by Mr. Watney and Mr. Williams to determine its position and make botanical collections. The route is for some distance nearly parallel to the mountains, and similar to the latter portion of the track from San Buena Ventura to Tumupasa. At a distance of about 20 miles it turns more towards the north, and as it recedes from the mountains a lower level is reached, and the ground, which appears to be often overflowed, is softer and full of mud-holes. Two large open spaces, or *pajonales*, were passed where the rank grass grew to a height of 5 feet.

Ixiámas stands at a height of 730 feet, at a distance of about 6 miles from the outer slopes of the north-western extension of the Bala-Susi range, on a bank of consolidated sand some 40 feet above a stream, the Tacasu, a tributary of the Hundumo, which is gradually wearing it away. All round are stretches of marshy pasture land which support large numbers of cattle. Here and there are slightly raised and drier strips covered with small trees, including the rubber-bearing Hevea. In the rainy season the surrounding country is inundated to such an extent that a loaded mule cannot pass.†

In July and August some of the inhabitants make their way down the Tequeje to the Beni to catch fish. There is a track to the northward to the Manutata ‡ by the sites of the abandoned missions of Santiago de Pacaguaras and Carmen de Toromonas, which has been occasionally traversed, (1) chap. vi.; (2) pp. 148–151. President Pando twice reached Ixiámas from the north-west, (11, 12).

The Indians, both of Tumupasa and Ixiámas, speak the Tacana language, which is allied to the Maropa of Reyes, and the idioms spoken by the Toromonas and Araonas of the Manutata and Beni. For a long time the Indians retained many of their ancient rites and customs,§ and even now, in the excitement of the feasts when the crops are sown or reaped, they sometimes worship their ancient deities. There are, I believe, non-Christian Indians (*barbaros*), Tacanas or Toromonas, living in the neighbouring forests, and it is probable that there is an understanding between some of the Christianized Indians and their wilder brethren. In an open grassy area or *pajonale* in the forest near the river Yuriapo, between Tumupasa and Ixiámas, which surrounds a hot spring, there are some huts where both are alleged to take part in the rites of their god, who resides in the double-peaked summit of Caquiahuaca,* which rises some 5000 feet above the sea.

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* Founded about the same time. Its inhabitants are Tacanas, Toromonas, and Araonas, by origin, (1) pp. 5, 14; see also (5) p. 25.

† It is believed that a force sent by the Inca Yupanqui to conquer the low country marched past Ixiámas and Tumupasa to Musu, which has been identified with the district of Mojos. It is possible, however, that Musu may have been a locality on the river Mosoj-huaico or Lanza; see also (1) p. 18. Subsequently, in 1539, Anzurez de Campo Redondo took the same route, and, passing by Zama (Ixiámas, formerly written Ysiamas) and the river Amapalcas (the Beni), reached a large river flowing from east to west, which Colonel Church believes to have been the Rio Grande branch of the Mamoré, (8) p. 145; (1) p. 14.

‡ Viz. "river-father" in the Araona dialect. It is also known as Mayu-tata (with the same meaning), Manu-ena (river mother), Manu-manu (great river), Amara-mayu (snakes' river), and Madre de Dios, (8) p. 146; (13) p. 11.

§ (7) p. 165.

I heard many stories of the dangers to be apprehended from meeting the *barbaros*, but the natives of Tumupasa did not seem to take many precautions in visiting their *chacras* or making other excursions in the forest. The *barbaros* are said to be in the habit of travelling between the lowlands and the mountains of the Tumupasa range near the river Yuriapo. It was close to the point where this route crosses the track to Ixiamas that a Christian Indian woman was killed in 1901. She was one of a party travelling from Tumupasa to Ixiamas, and lingered behind with her child; the latter was carried off. Any, murders committed by the wild Indians are attributed, but not always correctly, to the formidable tribe of the Guarayos, or Guacanaguas. In the last century they were known as the Tiatinaguas. At the present time they are usually called Guarayos, but must not be confounded with the Guarayas, a Christianized tribe to the south-east of the Mamoré.† The Guacanaguas profess undying hatred to the Christian Indians. A long time back the relations between the two were quite friendly; indeed, it is stated that some of them accepted Christianity, and formed the mission of Santiago de Pacaguaras.‡ Some of them apostatized, as it is termed, about a hundred years ago, and the mission finally disappeared in 1840. It was probably at an earlier date, when the Guacanaguas used to come in to the *fiestas* at Ixiamas, that the incident arose which gave rise to the feud. One of the Guacanaguas, who was on a visit to Ixiamas, committed some serious offence—theft of sacred vessels from a church, or an outrage on a woman, according to different accounts. His lips, ears, and nose were cut off, and thus mutilated he went back to his tribe, who thereupon vowed eternal war against the Christian Indians. Their warcry is said still to be an imprecation against Ixiámas.[*] They carry banners with the form of a monkey or other animal woven into it, and are the ablest and most determined of the Indian tribes.

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* (1) p. 46.

† It is, of course, not impossible that the two are related. The names Paiconeca and Paunaca, applied to dialects spoken by some of the inhabitants of Concepcion de Chiquitos, may be other forms of Guacanagua. R.P. Fr. Pablo Fernandez of Tumupasa told me that, so far as he was aware, the only tribe allied to the Guacanaguas in race and language were the Iñapadis, or Iñiparis, (13) p. 12, who live further to the north-east. They are not so irreconcilable as the Guacanaguas, but sometimes unite with them to make war on other tribes. I cannot, however, find any other reference to the Iñapadis. See (1) pp. 22, 34, 46-49; (2) p. 159; (7) pp. 168, 228, 294-296, 308; (13) pp. 17, 67. Guarayo appears to mean fighter, murderer, ferocious savage or outlaw. (1) pp. 40, 49; (11) p. 200; (13) p. 67.

‡ (7) p. 295. If this be so, it is not easy to understand why the mission was named after the Pacaguaras, who are a distinct tribe allied to the Chacobas and Caripunas of the Mamoré and the Madeira and to the Panos of the Ucayali, (2) 159; (7) p. 308.

Near Tumupasa the mountains appear to consist of two ridges, as on the Beni, though rather closer together. Between them, and on the south-western slopes of the inner south-western range, the harder sandstones are overlaid by soft red sandstone, similar to that already mentioned as forming the foothills in other places. The principal streams that reach the great plain appear to have their origin in the higher south-western range and flow out through gorges in the north-eastern. There is one stream, the Tejámanas, that takes its rise to the south-west of both ranges, which it traverses in a broad valley on its way to join the Rio Tequeje.

BALSAS DRYING, PUERTO MAPIRI.

I left Tumupasa on December 23, ascending the stream that flows past the village and takes its name, to a point named Sadiri 2600 feet above the sea, at the entrance of the col in the south-western ridge by which the track passes.[†] After an awkward descent over slippery clayey soil, the route continues westward through the forest, over Yuroma hill to the little plateau on which stands the mission village of San José de Chupiamónas,* about a mile and a half from the left bank of the Tuiche, 425 feet above it, and 1515 feet above the sea. The plateau is composed of a conglomerate of large rounded pebbles of quartzite and other rocks, auriferous in places, resting on red shaly sandstone. A little below the village is a small lake used for washing and bathing, which has no visible outlet. To the south-west there is a magnificent view of the Eslabon mountains, in the intervals in which the still higher summit of Huaina Jatunari may be seen.

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[*] This was the story told me, but it is probable that the incident really happened to the Toromonas and Araonas, (1) p. 46.

[†] At this point is a tumulus, which may mark the burial-place of an Indian chief.

The village consists of a large church, a belfry with two or three bells, and a convent of a single storey, with about twenty huts, most of them arranged round a square grassy plaza. A certain amount of ground has been cleared round the settlement, but the forest is already in a fair way to regain much of what it had lost. Few crops are grown on the plateau itself, but there are numerous *chacras* on lower ground, especially on the other side of the river a little downstream. In these all the inhabitants have huts, where they spend the greater part of their time, rarely returning to San José, except on Sundays and feast days. From a point on the north-west margin of the plateau a view is obtained of the course of the Tuiche nearly as far up as Buturo. Several larger expanses of high ground are visible north-east of the river. On these there are fertile strips of open country which were once cultivated. One, known as Turucuchi, is between the rivers Sachianu and Tachiapo, and another lies between the Tachiapo and the Pavi, which enters the Tuiche about 1½ miles above San José.† But these have all been abandoned on account of the dangers from the *barbaros*, who are increasing in numbers in this region, having been disturbed in the low country by the rubber-collectors. In the wet season they keep to the hills and do not cross the Tuiche, but when the river is low even the *chacras* on the other side are not safe. About a year previous to my visit, two San José Indians were killed on the Rio Pavi; the *barbaros* stripped them of their clothes, which they tore in their hurry and made off at once, and the river Pavi is now rarely passed by the Christians.

San José was originally founded by the Franciscans in a pajonale or open space near the mouth of the river Esiliamas, a tributary on the right bank of the Tuiche above the Sachianu. This was found to be unhealthy, and the mission was shifted to one of the pajonales near the river Tachiapo. Subsequently, probably on account of the *barbaros*, it was transferred a second time to a place called Bihua (*Biwa*) on the Tuiche, below the *chacras* above referred to,* and later on another move was made still further downstream. The next site was on the Chupiamónas, which flows into the Tuiche on the right a little higher up than San José. It was from this locality that the mission took the latter part of its name. This also, like some of the previous sites, proved very unhealthy, and the mission was moved to the border of the little lake below the present site. This was not a success, and when the present padre Señor Bernardo Clerici came, he found only three or four huts and no church. He brought the village up to its present position, which is in every way satisfactory. The only drawback is the fear of the *barbaros*, on account of whom the inhabitants are anxious to remove to a fertile site down the river near the mouth of the river Eslabon, but have hitherto been dissuaded by the *padre*. In the matter of health at least the change is not likely to be a favourable one.

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* Sometimes written Uchupiámas or Uchupiamonas, (1) p. 4, 22; (5) p. 24.

† The Tachiapo rises near the source of the Tejámanas. R.P. Fr. Comas, a former missionary at Ixiámas, is said to have reached San José in one day, but it is uncertain where he crossed the mountains.

The original inhabitants were nearly exterminated by an epidemic. Their language, which was distinct from those of adjoining tribes, has now disappeared, (1) p. 5. The present population speak partly Tacana and partly Quichua, and are of mixed race, some coming from the Tumupasa side, and others from the direction of Apolo. I was much impressed by the good results of the work of the Franciscan fathers at Tumupasa, Ixiámas, and San José.

From the *chacras* below San José we descended the Tuiche in a *callapo* of two *balsas* with Señor Valdes of San José and some Indians, including the so-called *maestro*, or schoolmaster,† and his wife and child. The river at first winds from side to side of a valley between hills of red sandstone, capped by coarse conglomerate, which is often auriferous like many of the river sands. In some places trunks of trees are seen in the sections of the ancient conglomerate in the cliffs. These are lignitized, and have given rise to rumours of the existence of coal in the district. After a time the hills recede, and the river runs through a swampy plain, which is continuous with that of the Beni. There are no more rapids, but the river is obstructed by aggregations of tree-trunks. We reached the mouth of the Yariapo three days after leaving the *chacras*. At this point on the right bank of the Tuiche, several *apostados*, Christian Indians who had reverted to savagery, established themselves some years ago, and occasionally attacked and killed those travelling by *balsa* on the river, and took possession of their clothing. An expedition was sent from San José against them; the two men were killed, and the women and children taken prisoners.

The *maestro* and his family continued their journey in one of the *balsas* down the Tuiche and the Beni to Rurenabaque, which they reached the next day, while the rest of us ascended the Yariapo. With great difficulty we took our *balsa* 3 miles up the river, to a point where the land was higher and the river swifter and shallower, so that it was impossible to get it any further. We continued our journey through the forest, following the stream along stretches of sandy beaches and through thickets of low shrubs, sometimes clambering over tangles of tree-trunks brought down in flood time. Further on low hills with red sandstone cliffs appeared on the right bank. On the third day we reached the road from Tumupasa, and so returned to San José, not without having suffered some inconvenience, as our Indian carriers had deserted us on the river to hunt wild pig in the woods.

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* Between the crossing and the *chacras* the grinding-stones of an ancient Indian village belonging to pre-Christian days can still be seen.

† He teaches the boys chanting, and assists in keeping the church and its contents in good order, but his chief fame is that of a hunter.

From San José we travelled across the mountains to Apolo. Watney and Turle went by the ordinary route by Eslabon and Jatunari, while I, with the botanist and Señor Valdes, decided to travel by the less frequented route by Ipurama, which branches off to the right about 7 miles from San José. The original route, on leaving San José, crossed the river Tuiche a little above the Rio Chupiamónas, and then ascended the valley of that river, but, owing to the proximity of the *barbaros*, it has now been altered, and crosses the Tuiche about half a mile lower down, at a height of 1090 feet above the sea, and then continues to the valley of the Chupiamónas. We stopped the night at Lumalio, a little *pajonale* on some high ground at the edge of the valley of the Chupiamónas, near a ridge of rock (1525 feet), where a fine view was obtained of the Bala-Susi mountains for nearly 100 miles, including Caquia-huaca and the Bala mountain itself near the Beni. Below, a bird's-eye view of the forest occupying the floor of the Tuiche valley was obtained. In it were two clear-cut elliptical *pajonales*. The origin of these open spaces is very difficult to determine. I have examined a good many in the forest near Tumupasa, on the road from Rurenabaque to Reyes, near San José, and in the region of the lower Beni. In many cases there seems nothing in the nature of the soil to account for the difference in the vegetation. It may be suggested that they represent ancient clearings by the Indians, but in that case it is difficult to see why they should not become rapidly overgrown like most neglected clearings made in recent years. My own suggestion would be that there is a fungus, or other organism, whose growth kills the trees, and that this spreads out from a centre, destroying them as it advances. It is remarkable that the few trees that are seen within the borders of a *pajonale* are usually feeble and sickly in appearance.

From Lumalio we ascended the Chupiamónas valley, repeatedly crossing the river, which was no easy matter, as it was full of large fragments of rock, among which the mules stumbled badly. Two or three miles up is the river known as Kerosinmayo, from the supposed existence of a petroleum spring. It was, I was told, inaccessible when I passed, as it was covered by the river, which was high.

Between the Chupiamónas and its tributary the Iridia, at a height of 1665 feet, is the little grassy glade of Cuquiplaya, the name being derived from the *cuqui* or *sauba* ant. From this point the two routes separate, the road ordinarily used continuing up the valley of the Chupiamónas to Eslabon. The other is known as the Baccarese road, from a Señor Baccarese, who originally had it traced out to facilitate the exploitation of the cinchona bark. This track is now practically abandoned, except by those taking cattle from Reyes or Ixiámas to Apolo, who use it because, being less frequented, there is more pasture available. Leaving Cuquiplaya, it rapidly ascends till at Aguamilagro* it is 3940 feet above the sea. Here an excellent view is obtained of the Bala-Susi mountains on the one side, and the ridge broken by the gap of Pensamiento or Ucumari,† by which we were subsequently to pass, on the other. The road ultimately descends to the valley of the Esiliámas, or San Juan, one of the more important affluents of the Tuiche. Here cinchona bark is still gathered by the inhabitants of Ipurama. We then ascended successively the valley of the Tori and that of its tributary the Huancané—the last characterized by excessive humidity; not only were the trees draped by long moss, but even the fronds of the ferns were overgrown with it. We now followed a steep

CALLAPO AT ISAPURI WITH TURLE, WATNEY, AND LECO INDIANS, CUSALI MOUNTAINS IN THE DISTANCE.

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* Probably a corruption of Agua de milagro.

† The native name of the black bear.

descent followed to a shelter or tambo at a place called Paraiso, near which three or four streams unite to form the river Ipurama at a height of 5370 feet above the sea.

From Paraiso the track quickly rose till at a height of 5620 feet tall trees became scarce though there was still a great deal of thick bush. At 6100 feet this gave place to bracken. At Pujyuyoj a height of 7010 feet was reached, and soon after the grassy rounded summit of Giteranipata came in sight, and proved to be at a height of about 7460 feet above the sea. From this point it is possible to see at one time a long stretch of the Bala-Susi mountains, the nearest point being about 50 miles away, and of the Cordillera Real, at a distance of about 100 miles. Illimani, Illampu, and Ancohuma, as well as Caquiahuaca, can easily be seen, and many nearer summits. Unfortunately, when I passed the view was obscured by drifting mist and rain.

From Giteranipata the road makes a sharp descent into the forest, but gradually rises, and is soon in open country again. As the undulating downs of San Antonio (6240 feet) are approached it passes through wide tracts of heather succeeded by grass land. In nearly every case where the rock was exposed to view it was more or less decomposed or lateritized to a yellowish or reddish clay. The road then descends to the river Jabutretuti, where it rejoins the eastern or old road. The name given to this stream signifies "looking at one another," and refers to the fact that those descending from one side of the valley can plainly see those coming down the other side. A little to the right of the road is a cottage where an Indian family reside, the first inhabited place after leaving Ipurama, while the older road runs through entirely uninhabited country from the Tuiche to the Jabutretuti.

I am indebted to Mr. Watney for some notes on this road. As we have seen, it separates from that which I followed at the junction of the Iridia and Chupiamónas. It then continues to ascend the valley of the latter, which it crosses repeatedly. At last the river is left behind, and a steep ascent in thick mud follows. After crossing a deep valley * the track rises to the Eslabon ridge (4015 feet), beyond which is the river of the same name,† about 2 yards wide. It flows into the Tuiche not very far from its mouth. Ascents and descents follow till Macho Jatunari is reached at a height of 4940 feet above the sea; the road then passes down to the Rio Hondo flowing to the south-east, but I cannot say whether this is identical with the river of the same name which enters the river Beni above the Tuiche. From this point the road improves and passes over comparatively low ground thickly wooded with palm trees, which were hardly seen elsewhere on this journey, to Mamacona, where there were formerly some inhabited huts. Thence it

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* The small stream Apadahua (*Apadawa*) that crosses the road at this point is said to flow into the Rio Esiliamas.

† Also apparently known as the Sipima, (7) pp. 228, 229.

gradually ascends till at the summit known as Pajonale Grande abo 7095 feet above the sea the travellers were fortunate enough to g a fine view of the snowy mountains of the Cordillera. After descendin again into the forest they emerged on to lofty open country, and ca in sight of the Ipurama track.

Beyond the Jabutretuti other streams were met with flowing lil it to the westward. The chief of these are the Turnia and Tori, bot with steep sides, especially the latter, where the descent over slippe decomposed shale to the river was somewhat difficult. Ascending tl other side the track climbed the slope of a lateral valley up to grassy plateau 6065 feet above the sea, which sloped gently dow to the edge of the deep valley of the Machariapo, another tributary the Tuiche. When we crossed there was little current, but the wat was almost too deep for fording. The ground on the other side w higher, standing about 5925 feet above sea-level. A long desce followed, which was rendered very troublesome by the greasy state the ground. Here also the rock was mainly composed of shale alter to a stiff clay, which the rain made extremely slippery, so that was difficult for man and beast to keep their footing. The slopes we covered with grass, on which a few cattle were feeding; they are n bred here, but are brought from Reyes or Ixiámas. Occasionally hu were passed. All these high grassy downs are collectively know as Jatuncama.*

Descending at last a sandstone escarpment, we came into a bro valley 3 miles wide running west-north-west and east-south-east, wit lofty hills and mountains rising to a height of 7000 or 8000 feet abo the sea on the other side. The few small streams we crossed flowe eastward, and, as we afterwards learnt, ultimately joined the Rio Ate that enters the Mapiri above Huanay; but the watershed was close hand to the north-west, beyond which the waters join the Machariap and ultimately reach the Tuiche. The surface of the valley was covere with only scanty verdure, for the rainfall is less than elsewhere in th district, and the altitude exceeds 4500 feet. Soil there is little, excep in the depressions, and in many places bare tracts of red lateritize shale are exposed to view. There were hardly any trees, a strikin contrast to the landscape to which we had been so long accustomed.†

We continued our journey to the southward obliquely across th valley to the town of Apolobamba, usually known as Apolo.‡ It i situated near the mountains on the south-west side of the valley at a height of 4550 feet above the sea, on fairly level ground traversed by two small streams that unite below the town.* At ordinary times these are insignificant in volume, but when in flood they become powerful torrents. They are crossed here and there by rough wooden bridges covered with brushwood, which, however, can scarcely be trusted with a loaded mule. The town is regularly laid out in squares and streets at right angles, but these are interrupted by the streams, and it is not every street that has a bridge. The houses, some three hundred in number, are constructed of *adobe*, and only one is of two stories. There is a large church containing elaborate wood carvings. The inhabitants consist of a few Bolivians, numerous cholas or half-breeds, and Indians. The original language of Apolo and the immediate surroundings was an Indian dialect known as Lapa-lapa or Lapucha, because the word *lapa* enters into the formation of the majority of the personal pronouns, and is therefore frequently used in conversation. The idiom, which does not appear to be allied to any other dialect spoken in the neighbouring region, is now however approaching

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* Sometimes written Alto cama, as if it were Spanish, meaning "high bed."

† I was told that there was formerly a certain amount of forest in the Apol valley which was all destroyed by the early settlers. The so-called cedar used for th woodwork of the church was obtained from the immediate neighbourhood.

‡ Apolo was founded in 1615 by Pedro de Legui Urquizo, Governor of Larecaja under the name of N.S. de la Concepcion (or de Guadalupe) de Apolobamba. H was harassed by the Lecos, and abandoned it, but reoccupied it a year or two later Subsequently he attempted to settle the country to the northward, inhabited by the

RIO BENI, PASSAGE OF BEU RANGE.

Agua-chiles (probably identical with the Siliamas, who derive their name from the river Esili-amas, *s* and *ch* being frequently interchanged, see *ante*, p. 607). He died of malaria at Calacoto. His followers were afterwards defeated by the Lecos in an expedition to the south, and Apolo was again deserted till the arrival of the Franciscans in 1682, (5) pp. ii., 11-14, 22-24; (2) p. 41. The name Cerros de Aquachile is sometimes applied to the mountains lying between Apolo and San José, and meeting the Beni in the gorges of Beu and Chepite, (1) pp. 4, 17, 18.

* The first site was close to the "Cordillera de Cola-pillosa," said to be rich in silver. The southern slopes of Jatuncama are reputed to contain silver, but we saw no trace of it, (5) p. ii.

extinction, being replaced by Quichua. Spanish is widely spoken, especially among the men, but there are many in the surrounding country who are quite ignorant of it.

The trade of Apolo is mainly connected with the exploitation of rubber in the country lying between it and the Mapiri and Caca, but the trees are smaller, and the produce from each tree is stated to be much less than in the low level plains of the Beni and Manutata (Madre de Dios). Concessions of rubber country have also been obtained to the north of Apolo on the Rio Mosoj-huaico or Lanza and Rio Pando.

Little cultivation is carried on round Apolo except in the hollows near the streams. Tropical produce is grown in the valleys of the Machariapo and Tuiche near Buturo. The rainfall in the Apolo valley, though not inconsiderable, as the meteorological notes given below will show, is much less than in the hills on either side, where it was often raining heavily when there was no fall in the town itself.

In some places the valley is crossed obliquely from side to side by ridges surmounted by huge blocks of friable sandstone, which rest irregularly on the shales. The presence of these sandstone masses appears to have protected the shales beneath from erosion, and so caused the formation of the ridges. It is difficult to say how the sandstone was brought into its present position. Possibly it may be all that is left of the *débris* brought down by mountain torrents that once descended from the hills on the south-west.

We made Apolo our headquarters from the middle of February till April 24. During this period we visited Aten, about 7 leagues distant. After descending the Apolo valley south-east for some distance, the track winds in and out of the hills which separate it from the smaller valley on the right (south-west), so that we had a good view of the lower part of the Apolo valley, and could see that the Turiapo and Macho Chorisa or Choricha that entered the valley on the opposite side had worn out deep cañons in the former surface; finally we descended on the other side of the ridge to where, at the meeting of the small valley already alluded to and another from the westward, stands the village of Aten. It consists of sixty or seventy huts, some collected near the church by the water side, others scattered about the slopes. The speech is mainly Quichua, but the older inhabitants still use the Rica-rica dialect, which is practically that spoken by the Lecos on the Mapiri and Caca. The climate is rather warmer and more humid than that of Apolo, and the locality less free from sandflies and mosquitoes, though there is little difference of level, for it stands only about 110 feet lower.

A much longer expedition was that to the valley of the Mosoj-huaico or Lanza. We ascended the Apolo valley, reaching a height of 5235 feet, and crossed the watershed into the basin of the Tuiche. A sharp descent brought us quickly down into the forests of the lower Machariapo, which we reached at a height of 3420 feet above the sea.

Travelling along the left bank we passed at short intervals small farms where tropical crops were cultivated. The lower portions of the valley were devoted to sugar cane, mainly grown for the manufacture of white rum. Near a large estate known as Asilla we crossed to the right bank of the river, and then journeyed over the hills to the rice-fields of Buturo (2295 feet) on the right bank of the Tuiche, which even here is a wide river, presenting indeed a much more imposing appearance than at the point where it enters the Beni. A few miles below Buturo is a considerable fall which completely interrupts navigation, and the portion of the river between Buturo and the Rio Pavi is little known and now wholly given up to the *barbaros*.*

Buturo has a warm and humid climate, and, like the rest of the lower Machariapo and Upper Tuiche valley, has an evil reputation for a severe form of malaria. It is quotidian, attacks returning every day in the afternoon, very difficult to shake off, and, like most forms of malaria in Bolivia, produces symptoms of the "bilious" variety, being accompanied by sickness and torpidity of the liver. Sometimes there is intense headache, and the fever is often fatal.

At Buturo we crossed the river in *bàlsas*, the mules swimming across, not without some difficulty, as the current is strong. We then continued our journey over alluvium covered with lofty forests to the Rio Asariámas,† passing a few cultivated patches on the way. From this point the settled region of the upper Tuiche was left behind, and the only signs of human occupation were the posts or shelters that have been formed along the track in course of formation to the rubber district of the Rio Pando.

We ascended the river Asariámas, which flows in a wide valley. On its slopes are considerable beds of gravel, and it may well have been once occupied by a much larger river. Following up the Rio San Juan, which joins the Asariámas on the right bank, we came to the clearing of San Juan at the junction of two narrow valleys (3255 feet), where a few huts have been erected and crops cultivated to facilitate the formation and maintenance of the forest track. We continued our journey up the smaller valley to the north-north-west, and then ascending its north-eastern slope, crossed a ridge (4540 feet above the sea) which separates the basin of the Tuiche from that of the Rio Cocos, whose waters flow into the Mosoj-huaico, and ultimately reach the Manutata. The track follows and repeatedly crosses the river, where the force of the current and depth of the water render many of the fords somewhat difficult to pass. Beyond the last, known as Anchoplaya, the track rises to the ridge of Munaipata, along which it runs till it descends to the Rio Mosoj-huaico, at the *tambo* of San Rafael (2310 feet), a mile or two below the junction of the Cocos. The Mosoj-huaico or Lanza is a powerful stream little inferior to the Tuiche at Buturo.*

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* The upper Tuiche was first navigated in 1642 from the village of Mojos, (5) p. ii. About 1670 Gonzales descended the river from the same place. He passed a settlement of the Suquitunia tribe, and having buried his weapons on an island in the river, returned by land with great difficulty, (5) p. 14. R. P. Fr. Armentia believes that he reached the island of Pueblo Viejo near Rurenabaque, where rusty arms were found by the Jesuits in excavating the foundations of their mission, (1) p. 4; (2) p. 39.

† Sometimes written Asariamo, or Asarasmayo.

We returned by the same route, by no means an easy matter, as the almost continuous rain had raised the Rio Cocos, and we were delayed day after day at the fords. Indeed, the valley has the reputation of being exceptionally wet, and it is only in June and July that there is much chance of fine weather. Our mules suffered much from want of proper food, for in the forest there was nothing for them to feed on except the leaves of a small palm and a climbing grass especially plentiful on Munaipata.

We arrived at Apolo on April 9, and on the 24th we left for Pelechuco. Ascending the valley, we turned westward through the hills to Santa Cruz del Valle Ameno.† It is situated on the side of a deep valley at a height of 5025 feet above the sea, has a cool climate, and is the chief centre of the cultivation of coca leaf in this part of Bolivia. It was formerly of considerable size, but has diminished from emigration to the rubber districts, and still more from the excessive death-rate, usually attributed to phthisis due to the insanitary state of the houses destitute of ventilation, but according to others it is largely the result of excessive drinking of the strong spirit or *resecado* (pronounced *resecao*) manufactured on the upper Tuiche. At Santa Cruz I met the subprefect, Señor Carlos Franck, a Swiss naturalized in Bolivia, to whom is due what little has been done to develop this part of the province of Caupolican in recent years.

From Santa Cruz del Valle Ameno the road lies over rocks which have been lateritized into a tenacious clay, on which travelling is very difficult. For long distances stone causeways have been formed, in other places thick logs have been laid down to form a corduroy road, but these are almost as objectionable as the clay. At some points a large log is missing, and the animals have great difficulty in crossing the gap, for they can find no footing in the churned-up clay below. The ground gradually rises till a height of 6355 feet is reached. Here a good view to the south and west is obtained. In front is a long spur which leads to the village of Pata,* to the right is the deep valley of the Tuiche which runs nearly due north, while to the left is the upper valley of the Rio Piliapo.

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* In 1897 Colonel (now President) Pando descended the Cocos to its junction with the Mosoj-huaico. He there constructed rafts, and continued his journey down the river past the mouth of the Saqui or Tambupata to that of the Asata, which he reached on July 27. He was attacked by Indians on August 5, and his followers were so discouraged that he had to march overland to Ixiamas, which he reached on September 2 after great privations, having passed an unknown river (possibly identical with the Abuyama or Heath), the Madidi and the Hundumo or Undume. For thirty-six days they had no other food than what they could find in the forest or the *chacras* of the *barbaros* (12).

† Founded by the Franciscans in 1720 as capital of the missions, (5) 27-31.

Pata is situated at a height of 4800 feet above the sea, on the hillside at the end of the spur above referred to. It is inhabited by Indians and half-breeds, who furnish most of the labour employed on the rubber properties that have Apolo for their headquarters. On the other side of the Tuiche, at a much lower level, is the village of Mojos,† situated on the river of the same name.

Leaving Pata, a steep descent follows to the Piliapo, where a tropical climate is again met with at an altitude of 3315 feet. The road then ascends high up on the left bank of the river, and follows its course on the hillside till it unites with the Rio Amantala to form the Rio Tuiche. The track continues along the upper part of the slope on the right bank of the Amantala in the hillside path or "*ladera*" of Jerusalén. Subsequently it descends nearly to the level of the river at Santa Rosa

RURENABAQUE, RIO BENI, AT THE FOOT OF THE SUSI RIDGE, THE NORTH-EASTERN LIMIT OF THE ANDES.

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* Founded by the Franciscans under the name of San Juan de Buena Vista about 1687. The original population included Siliamas and Pamainos. The first site was too cold for the Indians; the second, on the river Piliapo, proved to be very unhealthy. It was then moved to its present position, (5) p. 21; (2) p. 40.

† Not to be confounded with the district of Mojos to the east of the Beni. The site was first visited by Urquizo, who reached it in 1615 from Camata in Muñecas. Subsequently, on his second visit he founded, in 1617, the village under the title of San Juan de Sahagun de Mojos, and built a church for two Augustins that accompanied him. It was subsequently transferred to the Franciscans, (5) pp. ii., 12, 14, 26.

(3170 feet), where the valley broadens out and has every appearance of having once contained a lake now filled up with alluvium.

Just above the confluence with the Rio de Pelechuco,* the Amantala is crossed by a wire bridge of primitive structure, the roadway being of wood covered with brushwood. The track then follows the deep narrow valley of the Rio de Pelechuco or Coran-huata, (5) p. 18. In the valley of the Amantala many small plantations of tropical crops were passed, but in that of the Coran-huata there is no resident population until Pelechuco is approached. It is fed by powerful torrents; the first of them, the Rio Fuerte, is said to be very dangerous in time of flood. It enters the river on the right bank, and is stated to owe its name to a fort that was maintained there by the Spaniards, but the word may equally well refer to the character of the river. This point is about 3635 feet above the sea. The road then ascends high up on the right bank to the *ladera* of Huai-llamacan, at an altitude of 4210 feet, where the climate is refreshingly cool after the heat of the narrow valley below.

A rapid descent follows to the bridge of Paracorin,† at 3810 feet, where the track crosses to the left bank. The bridge is a wooden structure between two rock masses that narrow the stream exceptionally at this point. Here we had a sleepless night from the minute fly known as "polvorina," which penetrates ordinary mosquito netting.‡

For some distance the rock consists of slates with graptolites. It is comparatively free from the effects of laterization. After crossing a little higher up by another bridge at Cule, the road ascends the hillside, reaching, in the *ladera* of Tecalo, a height of 5330 feet. The river is now a mountain torrent with a steep course, so that when the road comes down to its level to pass the Quichara stream, the altitude is still as much as 5160 feet above the sea.

Again the road ascends the slope on the right-hand side of the valley, and the first traces of glacial striations are met with. Further on it crosses a ledge between the successive leaps of the magnificent cataract of the Rio Ignacio, and subsequently descends to the main river, now at a height of 5735 feet, to pass the valley of the Tanuara. Beyond it ascends to 7245 feet; when the snow-clad summit of the peak of Pelechuco comes in sight. The level of the river is again reached near Sant Anna or Callcan (Caican), an abandoned settlement 6950 feet above the sea. From this point the track closely follows the river, the diminished vegetation and the fact that the rocks are no longer decomposed into laterite rendering this possible. At the mouth of the Rio Fornada, at a height of 7300 feet, the road crosses by a bridge to the left bank and rapidly ascends, keeping near the torrent. Huts now occur at frequent intervals along the track. The climate as far as Llama-chaqui (9910 feet) is that of the colder temperate regions, and the rocks and ledges are filled with plants of familiar types. Above this altitude the country takes on a bleaker facies, and Pelechuco itself, at a height of 11,580 feet, stretches across the bottom of a sombre valley. It is a fairly large place, containing perhaps five hundred houses or small huts. It enjoys a certain commercial prosperity, being the *entrepot* for the import and export of goods to and from a great part of Caupolican. A Peruvian consul resides there, who facilitates the passage of rubber and other goods through Peru. The valley is nearly always involved in mist, which is condensed as the prevalent east wind rises on approaching the Cordillera.

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* This neighbourhood, known as Amantala, is said to be malarious. Its altitude is 3380 feet.

† This appears to contain the same root as Coran-huata.

‡ We met with the same trouble in a less degree a little below the confluence of the Rio de Pelechuco and Rio Amantala, and also at San Rafael on the Rio Lanza. It is for this reason that fine muslin is used instead of netting in Bolivia.

From Pelechuco I made a short expedition to examine the new mule track to Pata then in process of formation. We ascended by a path cut in the hillside to a high-level valley which enters the upper slopes on the left of the main valley, about a mile below Pelechuco. It commences some 10 miles to the westward in the snow-fields of the Cordillera Real, and lateral ravines on the south side join it from other portions of the main range. The lower part was covered with grass, and afforded a certain amount of pasture for cattle. At one point were a number of primitive circular huts built of blocks of rock; those of the lowest circle were large, and nearly as high as they were broad, while above they were flatter, and placed so that each row projected inwards beyond that below, the highest circle being so small that a single flat stone was sufficient to close the opening in the centre. After following the valley upwards for about 2 miles, the road ascends the northern slopes by a series of zigzags. Looking back I recognized at some points on the southern side of the valley floor traces of moraines corresponding to several successive positions of a glacier which once extended further down on that side than on the other. At a height of 15,095 feet, the track passes over the northern margin into an amphitheatre of black shaly rocks with here and there a patch of snow, and then leads north-westward across a steep slope above a clear mountain tarn.

We now reached the main Queara valley, which runs north-east parallel to that of the Rio de Pelechuco. An abrupt descent of several hundred feet led to a kind of step occupied by a small lake.* Beyond there is a still steeper descent down to another level platform, where stands the finca or farm of Queara (11,100 feet). It is less than 500 feet below Pelechuco; but, shut in as it is and facing the north, it has a much milder climate, and European fruit trees are said to flourish.

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* Most of these mountain lakes appear to owe their origin to the accumulation of *débris* from the slopes. In some cases, however, especially on the south-west side of the Cordillera Real, the barrier is formed of morainic material.

Below Queara the valley continues to descend by sudden drops corresponding to enormous landslides, which have filled up the narrow valley and allowed the formation of alluvial flats above. In some of these there is pasture for cattle, and maize and other sub-tropical crops are cultivated. The track now leaves the river and ascends the right-hand side of the valley till it reaches gentler slopes, which are covered with grass. Far above is the old Inca path through the mountains to Mojos. We soon arrived at the end of the track, which was still in process of formation, and then had a difficult clamber over boggy ground till the Inca path was reached. This was somewhat difficult to follow, ascending and descending nearly vertical rocky staircases, and crossing smooth dip surfaces of slate, where, however, a ledge of rocks had been somehow fixed to secure a footing. Incredible as it appears to the stranger, the Indians are able to take mules along the path. Following this ancient route, we reached the mountain shoulder of Calle.* From this point it was easy to follow with the eye the course of the river. It unites with the river Naranjani (river of oranges) to form the Rio Mojos, which, as I have already stated, enters the Tuiche opposite Pata. The lower part of its course was visible from Pata, but the spot where I now stood was then covered with clouds. From Calle I saw clearly the mountains round Pata, Santa Cruz, and Apolo, and beyond, not only the heights of Jatuncama, but a portion of the Jatunari or Bala-Susi mountains; while to the northward a good view was obtained of what I believed to be the Carabaya mountains.

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* In Spanish a "street," referring, I suppose, to the Inca track, which continues down to Mojos. Thence it probably followed the present route by way of Pata to Santa Cruz del Valle Ameno. The stone causeway between those places may, to some extent, date from Inca times. Then, I believe, the old route led across the head of the Apolo valley and Jatuncama to the river Ipurama. I was told that one day's journey down the river from Ipurama, remains of the road were still visible, and palto (alligator-pear) trees growing, which had sprung from those planted by the Incas; that it continued through the forest and across the Bala-Susi mountains to the great plain, where traces of it were to be found; and that ultimately it reached the Madidi or Beni. This is confirmed by the R.P. Fr. Codinach, who told Colonel Church that an Inca road, 25 feet wide, ran past Ixiámas from the direction of Cusco towards the Beni. Long lengths were well paved and still visible, (8) p. 150. We are also told of another Inca road that led past Suri and Camata (in Muñecas) and Aten to Jatuncama, and thence by the gorge of the Siliamas (Esiliamas) to San José de Chupiamónas (or more probably one of its older sites near the Esiliamas); see (1) p. 22. Its width was "very regular;" it was paved according to locality, and had small fortifications "at the high points of the *pampa*" (see 'Memoria historica del Colegio de San José de la Paz,' by R.P. Rafael Sains (unpublished) (6), (8) p. 148. The latter portion appears to have coincided with the road first mentioned. Traces of this road may also be seen near Mamacona, between Apolo and San José, (1) p. 14. The route from Pelechuco to Pata by the Coran-huata and Amantala was opened early in the eighteenth century, because the Augustins objected to the Franciscans passing the mission at Mojos, (5) pp. 16-18.

I left Pelechuco on May 9, and continued to ascend the valley towards the Cordillera. On the north-west were lofty cliffs, while on the south-east the slope was less. The entrance to one lateral valley on that side appeared to be occupied by the moraine of an old glacier, through the centre of which a stream had worn a passage. About 6 miles from Pelechuco the valley turns to the west, while the road climbs the southern slope into another higher valley containing two small lakes. The nearest of these belongs to the drainage of the Pelechuco valley and the Atlantic system, while the overflow from the other ultimately reaches Lake Titicaca. The watershed is at a height of 15,375 feet.

SAN JUAN, FOREST POST ON THE TRACK FROM BUTURO TO R. MOSO-HUAICO OR LANZA.

Nearly the whole of the journey from Pelechuco was performed in a snowstorm, which became gradually more dense, till it was impossible to see more than a few yards. We passed herds of llamas and alpacas, which were being driven home to shelter, and at last reached at Cololo the small stone huts of the Indians who owned the flocks. I was told that it snowed almost every afternoon; yet, in spite of their apparently uncongenial and comfortless surroundings, the Indians are comparatively well-to-do, owning a large number of these Western camels, whose wool fetches good prices in the nearest Peruvian towns. When we moved off in the early morning it was still freezing hard, and the snow covered everything, but the day soon brought a considerable increase of temperature, and before long the lower ground was clear. In many places glacial striation was visible in the surface of the rock. We followed the river Cacachamoca to the point where it enters Lake Cocha-quin-grai,* which stretches south-west for 5 or 6 miles. We continued our journey on the north-west bank, while the route to La Paz is on the opposite side. The south-west end of the lake is apparently a mass of moraine material, which forms an expanse of irregular hills with pools in the hollows. After passing the river Sorapatamayo, which flows from north-west to south-east from Sorapata (Altarani) towards Lake Titicaca, a low ridge was reached, which is probably also composed of glacial material. On the other side of this were more pools with a little pasture round them, on which llamas were feeding. Beyond stretched a level and nearly barren plain for 8 or 9 miles, to the low hills near Cojata. One or two streams we met with flowed towards Lake Titicaca, the most important being the river Cojata, which is on the Peruvian side of the international boundary. The latter was marked by adobe pillars at long intervals. There was no custom-house, or any restriction on the free transit of persons or goods. Cojata is a small well-to-do town chiefly engaged in the wool trade. It is at a height of 13,875 feet above the sea. The climate is severe, and snow frequently falls.

From Cojata the road passes over a series of ridges of more or less calcareous sandstones by Calingache and Giterani to Bilqui-chicu. The valleys are in many cases fertile and well watered; crops of barley and quinoa are grown, and there is pasture for numerous cattle. Leaving Bilqui-chicu, which is a small but apparently prosperous village, the road skirts the lake for some distance, and then, passing hills of dark-blue limestone which rise out of the alluvium, reaches the little town of Huancané. Thence it continues across a flat alluvial plain, through which the river Rames flows towards the lake that probably once covered the whole plain. It is passed on *balsas* formed of a kind of reed that grows in the lake. About 3 miles beyond it the town of Taraco is reached, near the foot of a low line of hills. Like the other towns and villages of the Puno, it is mainly inhabited by Indians. A large part of it consists of the crumbling walls of roofless houses, and its population must now be very much less than it once was.

Crossing several more ridges of limestone or sandstone, separated by more or less barren alluvial plains, Juliaca, the junction of the Sicuani and Puno branches of the South Peruvian railway, was at length reached. From Juliaca I returned to La Paz, whence I travelled again to Sorata, and then crossed by the Tipuani route, which I have already described, to Huanay, and once more descended the Beni as far as Rurenabaque.

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* *Cocha* means "lake."

Before describing my further journey down the Beni, I propose to refer briefly to the general structure of the Andes in Northern Bolivia, and the water system of the rivers that drain them. The details of the geology of the country traversed by the expedition will be dealt with in a paper I propose to read before the Geological Society. The classical work of Alcide D'Orbigny[*] and David Forbes[†] has already made us acquainted with the main features of the geology of the highland plateau (altaplanicies) and the country between it and the Pacific, as well as that of a large portion of Eastern Bolivia.

The western coast of South America has a south-eastern trend from Cape Pariña in lat. 4° S. to Tacna in lat. 18° S., and the direction of the different ranges of the Andes is approximately the same between those latitudes. The western or rather south-western Andes appear to consist mainly of strata of secondary and later age, with interstratified and intrusive igneous rocks, while on the plateau or altaplanicies between them and the Cordillera Real we meet with ridges of rocks of devonian, carboniferous and permian or triassic age rising out of alluvial deposits derived from the erosion of the adjacent hills and mountains.

The Cordillera Real enters Bolivia near Pelechuco, and runs south-east to Illimani. As far as the margin of the Tipuani valley it appears to consist mainly of slates and intercalated arenaceous beds forming an involved anticlinal, which probably includes rocks of every age from cambrian, or at any rate ordovician, to lower devonian. Granite intrusions are said to occur at some points in the Province of Muñecas. Further to the south-east a core of granitic rocks has been introduced into the centre of the synclinal. It is this that by its greater power of resisting eroding agents has given rise to the magnificent succession of lofty peaks from Ancohuma to Illimani. To the north-east long spurs stretch out from the main axis, but no definite range is met with till the important chain is reached which I have called the Cusali mountains. These form a line parallel to the Cordillera Real at a distance of 55 miles from it. North-westwards they appear to be prolonged into the lofty hills on the south-west side of the Apolo valley, the highest of which is known as the Cerro de Santa Cruz, while south-eastward they form a wall on the north-eastern side of the valleys of the Coroico and Yara. It seems probable that still further in the same direction the same range is traversed by the Rio de la Paz, and that it then forms the watershed between the upper valley of that river and that of the Rio de Cochabamba. So far as my observations extend, these mountains are composed of slates, sandstones, and limestones of palæozoic age.

Another less-defined line of hills is passed on the Rio Caca at

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[*] 'Voyage dans l'Amérique Méridionale,' vol. iii. parts iii. and iv. (1842).

[†] "On the Geology of Bolivia and Southern Peru," *Q.J.G.S.*, vol. xvii. p. 7 (1861).

Chiniri, and may correspond to the hills north-east of the Apolo valley. The Beu and Chepite ridges traversed by the Beni near the streams of the same names are also well-marked features in the topography of the district. The former may be represented further to the north-west by the Giteranipata and Chiru-Choricha mountains, and the latter by the Ucumari and Jatunari ridge. The hilly region between the Tuiche and Esiliamas appears to be unrepresented by any high land in the neighbourhood of the Beni. Finally, the Bala-Susi mountains also consist of two ridges, the outer or Susi range being comparatively local. These mountains are the last of the foothills of the Andes, and constitute the boundary of the great Amazonian plain from a point south-east of Rurenabaque north-westward for more than a hundred miles.

All the country from Pata to the Bala-Susi range near Batun is high above the sea, except for the narrow valleys of the Tuiche and some of its tributaries, but between Huanay and Rurenabaque the intervals between the ridges are mainly occupied by broad expanses of alluvium and low hills of sandstone and conglomerate of comparatively recent formation. Still further to the south-east the Beu, Chepite, and Bala-Susi mountains die out, and the lowlands that flank them merge in the great central alluvial plain of South America.

It will be noticed that all the parallel ranges from the Cordillera Real to the Bala-Susi mountains are traversed by rivers flowing from south-west to north-east. There are cogent reasons for believing that the course of these streams dates from a remote period—before the evolution of the present features of the country, in the course of which the ridges and valleys have been formed by differential earth-movements and the operation of subaërial agents of erosion, and the depressions filled in with an enormous amount of detrital material of various ages, some of which appears to have been afterwards subjected to considerable earth-movements and erosive action.

As the lines of hills rose and the longitudinal valleys were formed by erosion and the same folding that elevated the ridges, the rivers cut deeper channels through the barriers which threatened to exclude them from the South American plain. This destructive action of rivers, which is nowhere so effectual as in mountain regions where the velocity of the current is great and its transporting powers are immensely increased, is sufficient to account for even the deep valleys that traverse the Cordillera Real itself, though it is possible that lines of weakness, local synclinals, or the occurrence of softer materials may have determined the locality of the main avenues by which the waters flow eastward.

It is probable that for a long period the surplus water of the altaplanicies passed out through the gaps in the Eastern Cordillera, and though at present a large area belongs to the inland system of Lakes Titicaca and Poopo, yet most of the rainfall from the north-eastern slopes, where the precipitation is heaviest, still passes to the north-east into the basin of the Amazon, and not a single stream flows out south-westward through the Western Cordillera. A similar state of things is met with throughout the portion of the Andes where the winds generally blow from the east. While heavy rains fall on the eastern Andes, the western ranges and slopes have always been comparatively rainless, and the streams that flowed into the Pacific have been unable to deepen their channels sufficiently rapidly to keep pace with elevation occurring along an axis intersecting their courses.

In Patagonia, where western winds prevail, the higher ranges are repeatedly traversed from east to west by deep river valleys, there having been sufficient rain during the elevation of the mountains to keep open the courses of rivers flowing to the westward.

PELECHUCO FROM NORTH-EAST, CORDILLERA IN DISTANCE.

In Northern Bolivia, the first foldings must have taken place in very early times; but at the beginning of the carboniferous period there is reason to believe that the sea stretched across the line of the present Cordillera Real. Before the close of that period elevation must have brought to the surface and exposed to denudation a considerable amount of land in the immediate neighbourhood, probably a longitudinal strip near the south-western border of the present altaplanicies. About the end of the palæozoic the land would seem to have extended further to the north-east over the site of the Cordillera Real, while rivers probably flowed out both to the south-west and north-east. As the folding proceeded the land on the north-east gradually rose and formed hills, but the streams still kept open their way through on that side. Even when mountains were formed large enough to rob the trade winds of most of their moisture, much of the precipitation must have occurred then, as it does now, on the western slopes of the range, and fed the rivers flowing through the gorges. At that time the state of things would have been very similar to what we now find in Patagonia, but with east and west reversed. There the watershed between the Atlantic and Pacific is usually found at a moderate altitude, yet the streams that flow westward from it pass through the lofty Cordillera to the sea. The rise of the Western Cordillera in Peru and Bolivia seems to have occurred at the close of the mesozoic period, and to have continued till modern times. An epoch of complete rainlessness at any time during this period of elevation would be sufficient permanently to bar the outlet to the south-west of streams from the plateau between the two ranges.

The history of the hydrography of the inland basin is at present obscure. There is every reason to suppose that it is a depression that owes its origin mainly to a differential change of level, and only to a less degree to the erosive action of water. At first the whole drainage would pass out eastward by deep valleys traversing the Cordillera—such as the Sorata-Mapiri gorge, the Rio de La Paz gorge, and the valley of the Pilcomayo—to the Amazonian or La Plata basins. Subsequently, during a period when the rainfall on the altaplanicies was almost entirely confined to the strip immediately to the west of the Eastern Cordillera, longitudinal folding must have occurred, which caused the formation of longitudinal synclinal valleys, separated by higher ground. In this way the comparatively rainless region of the central and south-western part of the plateau was cut off from the north-eastern portion and from the Atlantic. It is true that the gorge of the Sorata and La Paz rivers is lower than any part of the Titicaca-Poopo basin, but there is now a ridge between the Sorata and Illabaya valleys on the one hand and Lake Titicaca on the other, which is nowhere less than 1500 feet above the lake, while there is every reason to believe that a similar ridge, covered in places by fragmental deposits, divides the La Paz valley from that of the Rio Desaguadero that connects Lake Titicaca to Lake Poopo. The valley of the Pilcomayo is separated from the inland basin by a rocky ridge that rises at its lowest point over 2000 feet above the latter.

The enormous deposits of alluvium in which, as we have seen, the La Paz cañon is now being eroded, appear to represent, not the alluvium of a lake, as is generally supposed, but the infillings of a longitudinal valley of depression formed close to the Cordillera Real.

When the gorge of the Rio de La Paz through the mountains had not been worn down to its present level, the torrents from the mountains brought down, as they do still, continuous supplies of sand, gravel, and boulders, which were spread out and accumulated on the valley bottom, as the slope of the effluent stream did not give it sufficient force to remove them. Now that the outlet has been worn deeper, and the inclination is consequently greater, the river is working back on all sides amongst the loose accumulations of the past.

Against solid rock which has not been lateritized or otherwise weakened by the action of underground water, the rate of cutting back is apparently very much slower. I made a careful examination of the head of the Illabaya valley near the Huallata pass. There seemed, notwithstanding the much greater declivity on the north-eastern side, to be no appearance at the watershed that progress was being made towards the south-west. In any case the advance must be very slow. I cannot believe that the operation of cutting back has appreciably affected the main features of the hydrography at this point.

The ranges to the north-east of the Cordillera Real appear to be the result of foldings of more recent date. They may be considered as successive crumples of the margin of the Amazonian plain.*

A few words must be said on the subject of laterization. Though it belongs mainly to the provinces of mineralogy and chemistry, yet it has such far-reaching effects on the surface features, the soil, and the character of the roads in most tropical countries, that it cannot well be passed over in silence in a paper dealing with the geographical features of such a region. Its operation is confined to rocks containing silica and alumina, as well as, in most cases, oxide of iron, lime, and other substances. In the process, much of the silica and lime is removed, and what is known as laterite is left. This is of varying degrees of hardness, according to the amount of iron and moisture present. In damp countries it is usually a slippery adhesive clay, which adds considerably to the labour of the draught animals in the valleys, and on steep slopes is sometimes a serious element of danger, as in places on the old road from San José de Chupiamónas to Apolo. In drier climates, or if a larger amount of iron is present, it may be as hard as brick, whence the name it has received. Laterite is never found to any extent at the present time except in the tropics, and not there at very high altitudes, though in India it occurs up to the summit of the Nilgiris at a height of nearly 8000 feet. In the region I have been describing, it reaches a height of 7000 feet, but the unaltered rock is everywhere found in or near the beds of rivers, where the water would wash away any of the material decomposed, or perhaps hinder the progress of the decomposition.*

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* The river phenomena in the Apolo valley indicate the probability that relative changes of level have occurred in comparatively recent times. The ancient wide and nearly flat-bottomed valley appears to have been formed at a time when the district stood at a lower altitude, and the fall and erosive power of the waters were less than at present, when the streams are cutting deep ravines in the floor of the old channel. The increased slope might be explained by the wearing down of a barrier at a lower level in the course of the river Aten or river Caca, but I am disposed to think that an elevation of the area round Apolo furnishes the true explanation.

After returning from a visit to Reyes, I finally left Rurenabâque on June 26, in the batelone which carried the mails. It had ten Indian rowers, and an assorted cargo of European goods and products of the country for sale at the rubber stations on the river, and was to bring back rubber. We descended the rapids of Altamarani formed by the gravel deposited by the river on leaving the mountains, and having completed our cargo, continued our journey, passing on the right bank Puerto Salinas, called after an Indian, Pedro Salinas, who made a track from Reyes to this point, and then on to Tumupasa. Below Santa Teresa, which is only nine hours' journey from Tumupasa, there are no inhabitants till the neighbourhood of the mouth of the Madidi is reached. After passing the Inaderi (Enadere), we lost sight of the Bala-Susi mountains in the mist, but when the air is clear they must be visible for a much longer distance.

On July 6, we reached the Peña de Guarayos (Rock of the Guarayos or Guacanaguas, who once had settlements in the neighbourhood). Below the mouth of the Madidi † Rubber barracas were frequently met with, and as a general rule we stopped the night at one of them. We had previously slept in the forest or on a broad sandy beach.

At Etea is the headquarters of the Intendente of the Beni. It is at the foot of a hill of lateritic material 70 or 80 feet above the river, the highest elevation I saw between Rurenabaque and the cataracts.

The next barraca is San Lorenzo, whence a track runs to the Manutata (Madre de Dios), which can be reached in two or three days. There is also a track for cattle and mules down the right bank of the Beni from Reyes to the rubber barracas, but it is very swampy and practically impassable in the wet weather. From Peña Vermeja, which we passed on the 13th, a track leads to Santa Anna on the Rio Mamoré, which can be reached in fifteen days. From the next barraca, Exaltacion, a track, crossing the Manutata at Genichiquia (6 leagues), the Orton at

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* It is evident that the process depends to some extent on the temperature; but Mr. T. H. Holland, the Director of the Geological Survey of India, who has reviewed the whole subject in the *Geological Magazine*, 1903, p. 59, points out that it does not appear to be operative in temperate regions and on slopes of the Himalayas that have a *mean* annual temperature equal to or higher than that of localities in the tropics 7000 or 8000 feet high where laterization occurs, but a much lower *minimum* temperature. He suggests that the phenomenon is the result of the action of a germ that cannot live where the winters are severe.

† The "black ant," also known as the Nagigi and Masisi, (10) Sp. tr. note, p. 7; (3) p. 38.

Palestina (20 leagues), and the Abuná at Santa Rosa (36 leagues), leads to the barraca of Capibara on the Acre (52 leagues).

From the Rio Genesuaya to Riveralta* there are few rubber properties on which the industry is carried on to any considerable extent, as they have been exhausted and will require some years to recuperate, but sugar-cane and tobacco are extensively cultivated. After passing the confluence with the Manutata and the island of Antenor, we arrived at Riveralta on July 16, having been greatly delayed by the time spent in peddling the cargo of the batelone at the different barracas at which we stopped.

There is little business transacted at Riveralta since the fall in the price of rubber in Europe, and the cessation of the period of speculation and inflation that prevailed up to about the end of 1900. It stands, as its name implies, on a high bank, and is cool, healthy, and almost entirely free from mosquitoes and sandflies.

From Riveralta I ascended the Manutata † in a steam-launch to Conquista, a station on high ground at a little distance from the river. Here there was formerly a large settlement of the Indians. I afterwards had a conversation with Señor Bernardo Pando, who lived among them for a year in 1884. They were like many of the wild Indians in this region, divided into two clans, the Araonas and Cabinias, marriage being only allowed between members of different clans. Almost the whole tribe was blotted out a year later by an epidemic of dysentery. The Indians now living at Conquista have come from the river Tahuamanu, one of the affluents of the Orton.

From Conquista I travelled about the forest, and had an opportunity of observing the life of the Indians, many of them *barbaros*, engaged in collecting rubber. As is the case everywhere in the lowlands of Bolivia, the Indians live in a kind of voluntary slavery. An account is kept with each man showing the salary earned, usually from fifteen to twenty bolivians a month, and the amounts owing for goods supplied, exclusive of the necessaries of life. The price of these goods is usually rather higher than the cash value, and the total owing is allowed to mount up till it approximates to the capital value of the labourer—about two years' pay. He is now bound till he can pay this off. Flogging is occasionally administered, as many as two hundred lashes being given. As long as they are employed in the healthy districts, the Indians do not seem, as a rule, to have much to complain of; but large numbers die of fever in the region of the cataracts of the lower Beni and Mamoré and of the Madeira, as well as in the river Abuná and lower Aquiri (Acre).

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* The lower Beni was first opened out by Dr. Heath in 1880, (10) pp. 128, 132.

† The upper course of the Manutata was long known to the Peruvians and the Franciscan missionaries. Its connection with the Beni was demonstrated by the ill-fated expedition of Maldonado in 1861. It was ascended in 1884 by R. P. Fr. Armentia to the mountains, (1) pp. 31, 87.

Many of the Indians are brought from the upper Mamoré and the neighbourhood of Santa Cruz de la Sierra or the Chiquitos. Others are kidnapped as children, either in the regions just mentioned or from savage tribes on the Manutata, or Orton, or their tributaries. Sometimes an Indian village is surrounded and all the children removed. It is this that is the chief cause of the trouble with the wild Indians. Many households have a kidnapped child, who is treated as a pet till he or she is old enough to work. The Bolivian Government is doing all it can to prevent the ill-treatment of Indians.

Travelling overland, we reached the Orton * at the barraca Peninsula, whence we ascended to Trinidad de Clames, the barraca of Señor Pando. We then descended the river in canoes past Palestina and Mercedes, from which points there are tracks across the Abuná to the Acre, to the confluence of the Orton with the Beni, and ascended the latter river to Riveralta.

I finally left Riveralta on July 11, and passing Florida, from which a track leads to the cataract of Guayamerim on the Mamoré, arrived at the cataract of Esperanza on the 13th. Two or three miles above Esperanza, there is a slight rapid, where a line of rocks is passed, running west-north-west and east-south-east. The cataract of Esperanza is much more serious, and completely blocks navigation, so that batelones have to be taken past it over the rocks. These are of coarse gneiss, and have the same direction as the rocks above, which are, no doubt, of a similar character. They are the first solid rocks met with after leaving Rurenabaque, though in many places hard ferruginous material deposited from the river occurs among the alluvial beds.

There are a large number of buildings at Esperanza, and a tramway has been constructed round the portion of the cataract which cannot be passed by batelones. The neighbourhood is malarious, as is the case with all the cataracts.

Continuing down the river, a brief voyage of three or four hours brought us to Villa Bella, situated at the junction of the Mamoré and Beni, just above the cataract of Madeira. I ascended the Mamoré for a short distance in a canoe, and found gneissic rocks similar to those at Esperanza.

On the 22nd I crossed to the Brazilian side of the river, which is inhabited entirely by Bolivians, except for a minor Brazilian official, a negro, and two soldiers from Santo Antonio, whose huts have received the title of Villa Mortinha. Little seemed known about the interior;

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* Its chief affluent is the Tahuamanu, which receives the Buimanu and Manuripi on the right bank. The sources of all these streams is in hilly country with rocks The name Tahuamanu was originally applied to the whole river, but the term Orton is now used for the portion between the confluence of the Manuripi (small river) and the mouth. Señor Ballivián says it is also called the Datimanu (river of turtles). (10) Sp. tr. note, p. 30. The nomenclature of Fr. Armentia is somewhat different, (1) 35.

but one of the small streams had been ascended for three or four days' journey, in spite of the malarious character of the region. There were *barbaros*, who, however, were not dangerous; hilly country was met with, but nothing was known about its extent.

I left early on the 23rd for Santo Antonio, in a *monteria*, a canoe from 12 to 14 feet long, with six rowers. It was fairly light, and easily transported over the rocks, and there was no cargo beyond my own effects, so there was little delay at the cataracts, and I reached Santo Antonio on the 29th.

I left Santo Antonio on September 10 in the steamer *Paes de Carvalho.* It arrived late on its journey up from Manaos, having been greatly delayed by the low state of the river, in spite of the fact that it was one of the smallest passenger steamers that navigate the Rio Madeira. The river was still lower when we descended; so that we could not travel by night, and occasionally suffered considerable delays from the difficulty of finding a practicable channel. We reached Manaos on September 24, and I left three days later by a steamer of the Booth line for Liverpool, where I arrived on October 18.

CLIMATE.

The seasons are not so well marked as in other tropical countries I have visited. There is no real dry season such as is experienced in India and South-West Brazil, and the distribution of the rainfall varies considerably from year to year, and from point to point. I crossed the Cordillera Real early in September in a slight snow-storm. It rained the greater part of the succeeding day on the upper part of the north-eastern slopes of the Cordillera. During the rest of the month rain only fell on one day, but on many occasions the sky was threatening, and rain must have fallen on the adjoining heights. In October, which was mainly spent in the valley of the Rio Caca, rain frequently fell, the total amounting to about 9·2 inches, falling on sixteen different days. In November at San Buena Ventura, just beyond the outside limit of the mountains, the total rainfall was 13·5 inches distributed over eleven days. In December it rained eight or nine days, on several occasions very heavily. The total for the month was probably about the same as for November. In January, in the Tuiche valley, it rained on eleven or twelve days, on five occasions heavily. In February, on the way to Apolo and at that place, it rained on ten or eleven days, often very heavily. In March, 6 inches fell—in fifteen days—at Apolo. In April, at Apolo and on the road to Pelechuco, it rained on ten or eleven days, about 5 inches falling. In the first ten days of May it rained or snowed, near Pelechuco and on the road to Juliaca, on three or four days. In June, on the way from Sorata to the Beni, it rained on seven or eight days. In the low country, in July, August, and September, occasional heavy showers occurred.

It will thus be seen that no month is completely free from rain, and that from October to April there is a heavy, but never continuous fall. The actual amount, however, varies as we have seen, from valley to valley and in different parts of the same valley, and diminishes, though in an irregular manner, as we pass from the Cordillera to the plains. Several days of rain may occur on the south-west side of the Bala-Susi range, while it is quite dry in the plains.

To the north-east of the Cordillera the prevalent winds are south-east and north-west. The frequency of the latter wind appears to become greater as the distance from the Cordillera increases. Everywhere to the north-east of the Cordillera the south-east winds brings cold, cloudy, and usually rainy weather. It is generally preceded by a period of low atmospheric pressure, but its arrival is accompanied, or even heralded, by a sharp rise in the barometer. In the plains this wind is known as the "Sur" or "Surazo." It often sets in with great violence, and the rain is sometimes followed by a period of cold dry weather. In Caupolican, when winds are light, they often blow from the south-east in the morning, and north-west in the evening. When the days are overcast, the sky sometimes clears for a short time soon after sunset, but soon clouds over again.

There is a general correspondence between the movements of the barometer at La Paz and in the plains, that is, a wave of high or low pressure affects both, but the resulting weather is widely different.

The temperature throughout the region I have been describing is lower than might have been expected from the latitude and altitude. The opposite table gives the chief particulars of the temperature and humidity of the different localities where any considerable stay was made.

In June, 1902, Mr. Turle and Mr. Williams travelled from Sorata to Aten by way of Cruz-pata, Tacacoma, and Colabamba, crossing the river Mapiri near Incachaca. From Aten they continued their journey to Apolo. They then travelled east-south-east, and ultimately north-east across the Chiru-Choricha range, which appears to be a south-eastern extension of the Giteranipata Mountains, and came within sight of the Jatunari range. The valley between drains to the south-east into the Tuiche. They returned across the Turiapo to Aten, and subsequently explored the country to the south-east of that place. Later on, they spent some time in examining the region south-west of Apolo, and south-east of Santa Cruz del Valle Ameno, and then returned to La Paz by way of Aten, Mapiri, and Sorata.

I have to record my acknowledgments to Mr. Turle for his assistance, and for his notes on the journeys last mentioned. Mr. Williams worked indefatigably at his collection of plants, which is, I believe, unrivalled by any other from the eastern slopes of the Andes.* Mr.

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* The species collected exceed 2000 in number, of which 800 are cryptogams, and at least 160 new to science. Four complete sets were taken, and a large proportion of

	Daily Temperatures.						Average humidity.
	Maximum.			Minimum.			
	Average.	Highest.	Lowest.	Average.	Highest.	Lowest.	Pressure of water-vapour.
Mapiri, Sept. 18–21, 1901	90·0	92·0	87·5	70·0	71·0	69·0	0·678
Mayaya, Oct. 3–6, 1901	92·2	95·0	88·5	72·2	76·0	66·0	0·813
Maquique, Oct. 6–29, 1901	89·8	95·5	77·5	71·4	73·5	68·5	0·832
San Buena Ventura, Nov. 1 to Dec. 3, 1901	87·1	95·5	72·4	72·5	76·8	64·0	0·838
Tumupasa, Dec. 8–22, 1901 ...	87·5	92·5	80·0	71·6	76·6	68·5	0·758
Tumupasa, Jan. 3–29, 1902 ...	82·5	87·0	70·0	71·3	74·0	63·2	0·766
Apolo, Feb. 20–28, 1902	77·7	82·0	69·0	65·2	68·0	63·0	0·583
Apolo, Mar. 1–13, 1902	75·9	83·0	70·1	64·5	74·4	62·6	0·608
Apolo, Mar. 14–31, 1902	77·7	86·2	68·5	63·5	68·8	59·5	0·605
Apolo, April 1–18, 1902	81·6	92·8	69·2	65·1	67·7	58·1	0·607

Watney had charge of the cartography of the expedition; the map that accompanies this paper is mainly his work, though Mr. Turle and I contributed topographical data regarding regions which Mr. Watney did not have an opportunity of surveying, and I am responsible for many of the orographic details. I can speak for the care and accuracy with which his astronomical observation were taken. The survey was carried out under exceptional difficulties. Almost all the hills were clothed with thick forest. This not only rendered access very difficult, but even when the summit was reached, the height and density of the trees made both astronomical and terrestrial observations impossible without the expenditure of an immense amount of labour in felling trees. Astronomical work was also interfered with by the frequency of cloudy weather, and the hazy state of the sky at low altitudes. The half chronometers were necessarily much affected by the rough methods of travelling, and the moist atmosphere, and consequently too much reliance must not be placed upon the longitudes. Repeated efforts were made to check the determination of longitude by observations of occultations, but, unfortunately, in no case did the state of the sky permit it.*

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the species are represented by specimens from different localities, so that the total number of specimens obtained amounts to many thousands.

* The positions of the following places, as shown on the map, were determined by astronomical observations: Charopampa, Isapuri, Mayaya, camp near Maquique, Mariara, camp on Beni below river Suapi, camp on Beni near Bala, San Buena Ventura, Tumupasa, Ixiámas, San José de Chupiamónas, Apolo, Aten, Asilla, Buturo,

AUTHORITIES QUOTED.

(1) ARMENTIA, R.P. FR. NICOLAS.—'Navegación del Madre de Dios.' La Paz, 1887.

(2) —— 'Limites de Bolivia con el Peru.' La Paz, 1897.

(3) BALLIVIÁN, MANUEL V.—'Diario del Viage de la Delegación Nacional. A los territorios del Noroeste de la Republica y el Departamento del Beni.' La Paz, 1896.

(4) —— y JOSÉ ZARCO.—'El Oro en Bolivia.' La Paz, 1898.

(5) —— edited by.—'Relación y Descripción de las Misiones . . . de Apolobamba' (dated Cuzco, 1747). La Paz, 1898.

(6) BRAVO, CARLOS.—'Limites de la Provincia de Caupolican o Apolobamba.' La Paz, 1890.

(7) CARDÚS, R.P. FR. JOSÉ.—'Las Missiones Franciscanas entre los Infieles de Bolivia.' Barcelona, 1886.

(8) CHURCH, COLONEL GEORGE EARL.—"Northern Bolivia and President Pando's New Map." *Geographical Journal*, vol. xviii. p. 144, 1901.

(9) CONWAY, SIR MARTIN.—"Map of part of the Cordillera Real of Bolivia." *Geographical Journal*, vol. xv. p. 564, 1900.

(10) HEATH, DR. EDWIN R.—"The Exploration of the River Beni." *Jour. Am. Geog. Soc. N.Y.*, vol. xiv. pp. 117-165, 1882. Translated into Spanish, with notes, by Señor M. V. Ballivián. La Paz, 1896.

(11) PANDO, PRESIDENT JOSE MANUEL.—"Viaje á la Región de la Goma Elastica." *Revista del Museu de la Plata*, vol. vi. p. 144, 1895.

(12) —— 'Expedicion del, al Inambary.' La Paz, 1898.

(13) PAZ, Dr. ROMAN.—'De Riberalta al Inambari.' La Paz, 1895.

(14) WEDDELL, H. A.—'Voyage dans le Nord de la Bolivie.' Paris, 1853.

I propose to deal with the subject of the hydrographical system of the Andes in a short paper before the Research Department of the Society. In the mean time I would only express my conviction that the phenomena referred to by Sir Thomas Holdich tend to support rather than contradict the views I have put forward.

Before the reading of the paper, the CHAIRMAN (Colonel G. E. CHURCH, Vice-President) said: It is a great pleasure to welcome here this evening Señor Aramayo, the Bolivian minister, and also Admiral Capello, Captain Vasconcellos and Senhor Ferreira do Amiral. Admiral Capello is a distinguished African explorer, while Senhor Ferreira do Amiral is President, and Captain Vasconcellos is Secretary, of the Lisbon Geographical Society. We have also Dr. Park Thompson, very well known as being past President and present Secretary of the Geographical Society of Queensland, a society which is doing splendid work in that far-off colony. Dr. Thomson quite recently received one of the Society's awards for his services

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San Juan, San Martin, San Rafael, Pelechuco, Juliaca. The longitude of Apolo was adjusted by a bearing on Illampu. I am inclined to think that the true position of Pelechuco is a little to the west of that shown, but there are not sufficient data to determine what correction should be made. Sir Martin Conway's map (9), which was found to be very reliable, was mainly followed for the portion within its limits. The portion of the Cordillera between the Rio Llica and Cololo and north-east of the latter place has never been surveyed, and has been only conjecturally inserted.

to geography. The paper this evening will be upon an extremely interesting portion of South America, perhaps the most fascinating of all, a district which was coveted by the Incas of Peru. The second Inca sent an expedition into the Caravaya district; the fourth Inca conquered Llaricasa just at the south of it; and the great Inca Yupanqui sent an army down the Mayutata river and conquered and pacified the whole of Caupolican, which district will be enlarged upon in detail by our friend Dr. Evans, whom I will now call upon to read his paper.

After the reading of the paper :—

The CHAIRMAN: We are favoured this evening with the presence of his Excellency Señor Aramayo, the Minister from Bolivia, and we shall be very pleased if he will make a few remarks.

Señor ARAMAYO: Although I am not prepared to take part in the debate on such an interesting paper as has been read this evening by Dr. Evans, I avail myself with pleasure of the opportunity so kindly offered me by the President in order to thank Dr. Evans, in my own name and in the name of my countrymen, for the great service which he has done to my country by the very interesting investigation which he has made of one of the most important districts of the republic which I have the honour to represent, and to congratulate him upon the success of his travels and for the excellent description which he has given us this evening of his explorations. Without considering myself biased in any way by an excessive patriotism, I think the region which has been examined by Dr. Evans, namely, the northern part of Bolivia, is one of the most interesting countries in existence, and most worthy of being thoroughly investigated in a scientific way, either geologically or geographically, as being endowed with the greatest variety of valuable productions, and having, as Dr. Evans has pointed out, a great variety of climate, besides being of comparatively easy access, and partly crossed by a great number of navigable rivers which flow into the Amazon. In fact, I believe it is only a matter of opening up the country by means of navigation and roads in order to make it one of the most enviable spots on the face of the Earth. I have pleasure in stating here this evening that the present administration of Bolivia has made strenuous efforts to explore all those regions which have been up to the present very little explored, and to encourage the explorations made by scientific societies. We have not been equally successful in our attempts to open out the country to the commerce of the world, on account of lack of financial support, and we have lately failed in an important attempt to open up the rubber districts of Beni and Acre on account of a certain amount of jealousy displayed beyond our frontier; but I feel confident that in the course of very little time, some years perhaps, we shall be able to open to the commerce of the world a most valuable region, capable of being the happy and prosperous home of many millions of settlers. I think it is worth mentioning, and certainly a very happy augury, that the King should have thought it convenient to appoint a minister resident at La Paz, a step which, I think, will tend to establish greater increase of friendly relationships between the two countries, and I believe to the benefit of both. I hope that the steps of Dr. Evans may be closely followed by other explorers, and I have only to say that they will be considered as the most welcome guests, and they will be given every possible facility to advance the work of civilization and progress which is the aim of this Society.

Sir MARTIN CONWAY: I have listened with very great pleasure and interest to the lucid account which Dr. Evans has given us, though necessarily so briefly, of his very interesting journey. Naturally it has interested me very much, because the region that he has travelled through and explored is adjacent to the region which I travelled in a few years ago, and his survey joins on to mine. I confess that I listened with some envy to his descriptions, and looked at his photographs likewise with envy, because the region through which he travelled, though not quite so magnificent as the central region of the mountains, has a far greater luxury, and far more of what we understand in the ordinary way as beauty. I have only looked down upon the fringe of this region, but I saw enough to know that here is a country of very singular and extraordinary beauty. You have a diversified land whose tangle of mountain ranges Dr. Evans has resolved into a series of essentially parallel ridges, parts of the same crinkles of the Earth as the Andes. You have those foothills with great magnificent forests, and you have valleys in between them rich in the soil which they carry and wonderfully rich in the vegetation which they produce, and you have a climate of extraordinary suitability for all purposes of agriculture of different kinds. The result is that you have there a region that is wonderfully suitable to human habitation, and that up to the present is, as we have learnt, practically uninhabited. It was through that region I desired to travel, and being unable to do so, it is with immense interest that I listened to Dr. Evans's account of what he saw there. It would not be becoming on my part to speak at great length about a country I have not seen, but I think I am justified in adding my word of thanks to Dr. Evans, not merely for the journey that he so well performed, but for the delightful description of it which he has given us to-night. I should like to add that he was accompanied, amongst others, by an American botanist, Mr. Williams, who made a very large collection of plants. I have seen the collection. I saw it in New York about two months ago, and it was described to me by the best living American botanist as probably the finest collection, or one of the finest collections, of plants that had ever been brought out of South America by a single traveller on a single journey. At all events, he has discovered approximately 250 new species, and has brought home 2000 specimens of different plants, and of each at least four different specimens. I hope to present in his name ultimately, both to the British Museum and to the Herbarium at Kew, a complete series of the collection made by him on this journey. The third collection will be deposited in the Herbarium of the New York Botanical Museum. Well, that is all I have to say, and I am very thankful to have had the opportunity of contributing my word of thanks to Dr. Evans and his companions.

The CHAIRMAN: We have also with us this evening our friend Sir Thomas Holdich, fresh from his triumph as a peacemaker between Chili and the Argentine Republic, and we shall be pleased to hear a few words from him.

Sir THOMAS HOLDICH: I regret very much that I could not follow Dr. Evans in his very interesting journey through Bolivia, and therefore I came here to listen to him and to learn something about that country, for I have never had the opportunity of making any practical acquaintance with it. But when Dr. Evans refers to Patagonia, I find myself a little more at home, and I regret that the only criticism I can offer on Dr. Evans's interesting remarks is one of some slight disagreement with his theory as to the formation and cause of the direction of Patagonian rivers. It is true, no doubt, as he says, that for billions of years the wind currents have been much the same across the Pacific from the north-west and the west, and precipitation has been very considerably greater on the west of the Patagonian Andes than it has on the east. But for all these billions of years, till within very recent periods, the rivers have not maintained the same direction. It is very evident to a casual observer that the rivers have changed their courses, and that rivers which flow into the Pacific used to flow into the Atlantic; and I think we must look to some other cause than wind currents for the present conformation of the rivers of Patagonia. I think that probably the alteration of their direction is much more due to the great process of desiccation which has been going on all through the world than to any action due to winds and air. This process is common everywhere. The glaciers are receding, and as they recede lakes are formed; lakes are drying up and moraines are formed, and the gradual alteration of the level of the highlands which border the foot of the Andes has been altering the direction of the rivers. There are one or two places even now in Patagonia of which it is difficult to say in which direction they drain—the Atlantic or the Pacific. That is all I can add to the interest of to-night's discussion. I have listened with very great pleasure to Dr. Evans, and wish to add my quota of thanks for what I have heard.

The CHAIRMAN: I am going to crave your indulgence for a moment by calling upon Dr. Thomson, who is the founder and head of the Queensland Geographical Society, which has done such admirable work in the southern hemisphere. Perhaps he will favour us with a few remarks on this occasion.

Dr. PARK THOMPSON: My object in offering a few remarks is not to discuss the very excellent paper with which we have been favoured this evening by Dr. Evans, but it is more on behalf of the society which I have the honour of representing, and of offering to you, sir, and the Fellows of this great British Society my very grateful thanks for the privilege conceded to me this evening in being present to listen to this very excellent paper. It has given me the greatest possible pleasure indeed to listen to Dr. Evans's remarks, and to follow him in his wanderings in that part of the country of which he has given us a very admirable description, illustrated as the description has been by very excellent photographs and the beautiful map which has been prepared by the Geographical Society. I beg, sir, without saying more, to thank you very gratefully on behalf of the society which I have the honour of representing, for the privilege of being here this evening and listening to this very excellent paper.

The CHAIRMAN: Perhaps I may be permitted also to say a word on this paper. The great province of Caupolican, known historically as Apolobamba, extends from the two Bolivian departments of Muñecas and Larecaja indefinitely towards the north. Geographers, both of Bolivia and Peru, have disagreed as to its limits. Many of the ancient geographers fix the northern boundary of Caupolican at about 7° 40′ S. lat., in accordance with the line of demarcation, from east to west, under the Treaty of San Ildefonso between Spain and Portugal. By the treaty of 1867 between Brazil and Bolivia, the boundary was changed to a line starting from the junction of the Madeira and Beni, at 10° 20′ S. lat., to the sources of the Yavari affluent of the Amazon; but the Brazilians now pretend that the limit between the two countries should be the parallel of 10° 20′ S. lat. In the varying changes of the twelve audiences of America made by the Spanish Government they shuffled the cards so with reference to departments and ecclesiastical areas that it is a very difficult problem to decide to whom belong certain territories, and I think it is more a question of occupation, perhaps, than it is of old boundary-lines; and thus Bolivia is probably more entitled than any other country to that region lying between the last two boundaries I have named. It certainly has shown great energy in developing that country, and in sending its sons from all parts of Bolivia to work the rubber deposits and make them valuable to commerce. It has laboured under great difficulties, because Bolivia is a Mediterranean country. It has no sea-coast to-day on the Pacific side; it is very difficult of access by the head-waters of the Purus river, and still more difficult by the Madeira, owing to the long line of nineteen cataracts, which interrupt navigation except by canoes, which means the hauling of them for days round some of the most formidable falls; but at the same time the country above these, according to my observation—and

I have travelled there a great deal—is perhaps the most beautiful of all South America. It has the noblest products, and the richest goldfields; I may say that in Caupolican and Caravaya and all that eastern slope of the interior range of Andes which lies to the east of Lake Titicaca, there is no country so rich in gold, and it is the region from which the Incas derived those treasures with which Atahualpa undertook to ransom from Pizarro the Inca Empire. The district from Santa Cruz, which is the eastern expression of the Andes, to the headwaters of the Mayu-tata, is one vast goldfield, but inaccessible for practical work to-day. But if its mineral wealth is so great, its agricultural resources are perhaps unequalled. It produces the best coffee in the world. There is nothing to equal the Yungas coffee. I may, perhaps, tell you that there is one little spot some distance north of La Paz, only an acre in extent, which was the burial-ground for a small Franciscan convent which still exists there. I believe that the monks have been dispersed, but the cemetery remains. There they grow the richest coffee in all Bolivia, so highly flavoured, that the two or three remaining monks send a distance of hundreds of miles, by native runners, presents of little boxes of this coffee of three or four pounds in weight. I once had this region described to me by an old man of the name of Holbrook, who walked all the way from Apolobamba, about 200 or 300 miles, to see me at La Paz and give me a description of the country. His evidence was that there was nothing obnoxious to be found there. In fact, in his most illiterate way he wrote down that "there were no venomous insects except tigers." But between the Andean tableland and the Yungas of Bolivia, there is, perhaps, the most beautiful range of snow-peaks in all the world. Sir Martin Conway will bear me out that it would be difficult to match that line of peaks which stretches over 180 miles between Illimani and Sorata. If you stand upon the Titicaca tableland and look eastward as the sun rises, there is nothing more glorious than to watch the sun as it breaks through those giants of the Andes. It is on the eastern slope of these mountains that we find Caupolican, which has been described to-night. It is a perfect paradise, but it is almost as inaccessible as the Paradise which we all seek. It now remains for me to extend to Dr. Evans your thanks for the admirable lecture which he has given us this evening.

FOUR YEARS' ARCTIC EXPLORATION, 1898-1902.*

By Commander R. E. PEARY, U.S.N.

It is a difficult thing to compress within the limits of an hour's talk the story of four years of almost continuous Arctic effort, but I shall try to fix in your minds an outline, at least, of the work of my last Arctic expedition. My original plan; the inception and formation of the Peary Arctic Club, which financed the work; my preliminary expedition of 1897, which secured and brought home the "Ahnighito," largest of known meteorites; Mr. Harmsworth's gift to me of the

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* Read at the Royal Geographical Society, November 10, 1903. Map, p. 724. We have to acknowledge the courtesy of the Peary Arctic Club in sending a copy of their report on the expedition: the main facts are embodied in Commander Peary's paper.

Windward; and my departure for the north in July, 1898, have all been noted in the columns of your *Journal.*

Sailing from Sydney, C.B., July 7, 1898, on August 13 the preliminary summer's work of hunting walrus and recruiting natives and dogs among the Whale sound Eskimo was completed, and the *Windward* headed north from Etah, while my auxiliary ship, the *Hope*, steamed south for home. Five days later the *Windward* had fought her way through heavy ice under Cape D'Urville on the northern side of Princess Marie bay. Here further progress was stopped by a large floe, one end resting against the shore, and the other extending out into the dense pack, completely blocking the shore lead. This proved to be the end of the *Windward's* journey. No opportunity to advance offered, and on the last day of August the new ice was 4½ inches thick. A large portion of my supplies and stores were landed, the boiler was blown off, and preparations for the winter were commenced.

The autumn work outlined itself. It comprised three items—the survey of the Buchanan strait, Hayes sound, and Princess Marie bay region; the securing of a winter's supply of fresh meat for my party; and the transportation of the maximum amount of supplies northward along the coast. The first object was accomplished in September, demonstrating the continuity of Ellesmere and Grinnell lands; the non-existence of Hayes sound; that Buchanan strait is in reality Buchanan bay, and Bache island Bache peninsula. Incidentally, the existence of bear, musk-oxen, walrus, and hare in the Bache peninsula region was determined. The northern shores of Princess Marie bay were particularly barren of animal and vegetable life, only a rare hare being seen. On October 7 the second object was accomplished by the killing of a herd of seventeen musk-oxen on the eastern part of Bache peninsula. By incessant effort, utilizing every bit of the moonlight, and working much of the time in entire darkness, I had on December 4 3300 lbs. of supplies cached at Cape Wilkes, on the north side of Richardson bay, with smaller intermediate caches between Cape Wilkes and the ship. No one who has not had the actual experience can imagine the work and annoyances involved in transporting, in semi or complete darkness, these supplies along the frightful icefoot which everywhere lines the ragged Grinnell Land coast.

On December 20, 1898, I left the *Windward* with a party of six men and thirty dogs—all that remained of the sixty odd with which I left Etah. Advancing the Cape Wilkes cache to Cape Lawrence, though seriously hampered by thick weather, heavy winds, and deep snow, I then pushed on with light sledges in an attempt to reach Fort Conger. Unfortunately, the delays had thrown us past the period of moonlight into the uninterrupted darkness of the very midnight of the "great night." The icefoot grew steadily worse as we advanced, until it became almost impassable for our comparatively empty sledges. At Cape Defosse our supplies gave out. At Cape Cracroft we were obliged to dig a burrow in a snow-drift, where I left two Eskimo and nine of the poorest dogs. Two more marches, one of eighteen hours' duration, during which, in complete darkness, we stumbled and fell and groped our way across the Cimmerian chaos of broken and snow-covered ice which filled Lady Franklin bay, brought us to the northern shore. Here a dog was killed for food, and, pushing on without sleep, we stumbled into Conger just after midnight on January 6.

Here I found that both my feet were seriously frozen, and, as a result, I lay on my back through the winter until February 19, when the beginning of the returning light enabled us to attempt the return to the ship. During this time we lived largely on cornmeal and molasses, and kept as warm as was possible by burning boxes and barrels. Lashed down upon a sledge, my feet and legs wrapped in a musk-ox skin, the return to the *Windward*, a distance of some 250 miles, was effected in eleven marches, my companions walking the entire distance. The mean minimum daily temperatures during this time was $-53{\cdot}^{\circ}18$ F.; the lowest, -65° F.

On March 13 the amputation of eight of my toes was effected, and on April 19 I started for Conger again, returning to the ship on May 31. In this journey the material abandoned by Greely at Conger was invoiced, twenty-five musk-oxen killed in the vicinity of the fort, and cached for future use, and an attempt made to reconnoitre the north-west Greenland coast. A reconnaissance from the summit of Cape Beechey showed Robeson channel to be filled from shore to shore with upheaved floe fragments covered with deep snow, and uninterrupted by large floes or areas of young ice. Crippled as I was, and unable to take my usual place ahead of the sledges, breaking a path with my snowshoes, the traverse of the channel was an impossibility.

A month's rest at the ship put my feet, which had become irritated with constant use, in better shape, and on June 29 I started west to complete the details of the Princess Marie bay—Buchanan strait region, and endeavour to cross to the west coast. From this trip I returned to the ship on July 28. The return journey was somewhat disagreeable, owing to the rotten state of the one-year ice, and the deep pools and canals of water on the surface of the old floes. These presented the alternative of making endless *détours*, or wading through water often waist and chest deep. Our clothing, tent, sleeping-gear, and food were constantly saturated, and on more than one occasion we slept in several inches of slush. But I felt repaid by the results of this trip. In spite of the lateness of the season and the handicap of my still unhealed feet, I had been fortunate in crossing the Ellesmere Land ice-cap, and from elevations of 4000 and 4700 feet had looked down upon the snow-free western side of Ellesmere Land, and out into an ice-free fjord extending some 50 miles to the north-west, beyond which appeared yet more distant land. The season on this coast was at least a month earlier than on the east side, where the ice of Princess Marie bay, though much fissured, was still practically intact, and the general appearance of the country reminded me strongly of the Whale sound region of Greenland. The game secured during this trip comprised one polar bear, seven musk-oxen, three bearded seals, fourteen ordinary seals, and a few hare.

On August 2 the *Windward* got away from her winter quarters, and, after six days' struggle with the ice, reached comparative open water and proceeded to Etah. Convinced of the thorough unsuitability of the *Windward* for any attempt to push farther north, I had decided to establish my base for the coming year at Etah. The year, though not marked by any startling results, had been a year of hard and continuous work for the entire party. During the year I obtained the material for an authentic map of the Buchanan bay—Bache peninsula—Princess Marie bay region; crossed the Ellesmere Land ice-cap to the west side of that land; established a continuous line of caches from Cape Sabine to Fort Conger, containing some fourteen tons of supplies; rescued the original records and private papers of the Greely expedition; fitted Fort Conger as a base for future work; and familiarized myself and party with the entire region as far north as Cape Beechey. Finally, discouraging as was the accident to my feet, I have been satisfied, since my

CAPE LAWRENCE, FROM THE SOUTH.

it to the north and north-west, as far as could be seen, were numerous lanes and pools. The next day was devoted to hewing a trail along the icefoot to Repulse harbour, and on the 23rd, in a violent gale accompanied by drift, I pushed on to the Drift point of Beaumont (and later Lockwood), a short distance west of Black Horn cliffs. The icefoot as far as Repulse harbour, in spite of the road-making of the previous day, was very trying to sledges, dogs, and men. The slippery side slopes, steep ascents, and precipitous descents wrenched and strained the latter, and capsized, broke, and ripped shoes from the former. I was not surprised to see, from the Drift point igloo, that the Black Horn cliffs were fronted by open water. The pack was in motion here, and had only recently been crushing against the icefoot, where we built our igloo.

VIEW ON BENEDICT GLACIER.

I thought I had broken my feet in pretty thoroughly on my journey from Etah to Conger, but this day's work of handling a sledge along the icefoot made me think they had never encountered serious work before. A blinding snowstorm on the 24th kept us inactive. The next day I made a reconnaissance to the cliffs, and the next day set the entire party to work hewing a road along the icefoot. That night the temperature fell to −25° Fahr., forming a film of young ice upon the water. The next day I moved up close to the cliffs, and then, with two Eskimo, reconnoitred the young ice. I found that, by proceeding with extreme care, it would in most places support a man. With experienced Ahsayoo ahead constantly testing the ice with his seal-spear, myself next, and two Eskimo following, all with feet wide apart, and sliding instead of walking, we crept past the cliffs. Returning, we brushed the thin film of newly fallen snow off the ice for a width of some 4 feet, to give the cold free access to it.

I quote from my diary for the 27th: "At last we are past the barrier, which has been looming before me for the past ten days, the open water at the Black Horn cliffs. Sent two of my men, whose nerves are disturbed by the prospect ahead, back to Fort Conger. This leaves me with Henson and three Eskimo. My supplies can now be carried on the remaining sledges. Still farther stiffened by the continuous low temperature of the previous night, the main sheet of new ice in front of the cliffs was not hazardous, as long as the sledges kept a few hundred feet apart, did not stop, and the drivers walked a few yards away to one side. Beyond the limit of my previous day's reconnaissance there were areas of much younger ice, which caused me considerable apprehension, as it buckled to a very disquieting extent beneath dogs and sledges, and, from the motion of the outside pack, was crushing up in places, while narrow cracks opened up in others. Finally, to my relief, we reached the icefoot beyond the cliffs and camped." The next day there was a continuous lane of water 100 feet wide along the icefoot by our camp, and the space in front of the cliffs was again open water: we had crossed just in time.

Up to Cape Stanton we had to hew a continuous road along the icefoot. After this the going was much better to Cape Bryant. Off this section of the coast the pack was in constant motion, and an almost continuous lane of water extended along the icefoot. A little west of Cape Bryant I killed two musk-oxen, the flesh of which my dogs highly appreciated. A long search at Cape Bryant finally discovered the remains of Lockwood's cache and cairn, which had been scattered by bears. At 3.30 p.m., May 1, I left Cape Bryant to cross the wide indentation lying between Cape Bryant and Cape Britannia. Three marches, mostly in thick weather, and over alternating hummocky blue ice and areas of deep snow, brought us at 1 a.m. of the 4th to Cape North (the northern point of John Murray island). From this camp, after a sleep, I sent back two more Eskimo and the twelve poorest dogs, leaving Henson, one Eskimo, and myself, with three sledges and sixteen dogs, for the permanent advance party.

From Cape North, a ribbon of very young ice, on the so-called tidal crack which extends along this coast, gave us a good lift nearly across Nordenskjöld inlet; then it became unsafe, and we climbed a heavy rubble barrier to the old floe-ice inside, which we followed to Cape Benét, and camped. Here we were treated to another snowstorm.

Another strip of young ice gave us a passage nearly across Mascart inlet until, under Cape Payer, I found it so broken up that two of the sledges and nearly all of the dogs got into the water before we could escape from it. Then a pocket of snow, thigh and waist deep, over rubble ice, under the lee of the cape, stalled us completely. I pitched the tent, fastened the dogs, and we devoted the rest of the day to stamping a road through the snow, with our snowshoes. Even then, when we started the next day, I was obliged to put two teams to one sledge in order to start it.

WINTER QUARTERS AT ETAH.

Cape Payer was a hard proposition. The first half of the distance round it we were obliged to cut a road, and on the last half, with twelve dogs and three men to each sledge, push and pull them snow-plough fashion through the deep snow. Distant cape was almost equally inhospitable, and it was only after long and careful reconnaissance that we were able to get our sledges past, along the narrow crest of the huge ridge of ice forced up against the rocks. After this we had comparatively fair going, on past Cape Ramsay, Dome cape, across Meigs fjord, we groped our way northward, over broken ice and across gigantic, wavelike drifts of hard snow. One more march in clear weather over frightful going, consisting of fragments of old floes, ridges of heavy ice thrown up to heights of 25 to 50 feet, crevasses and holes, masked by snow, the whole intersected by narrow leads of open water, brought us at 5 a.m. on the 16th to the northern edge of a fragment of an old floe bounded by water. A reconnaissance from the summit of a pinnacle of the floe, some 50 feet high, showed that we were on the edge of the disintegrated pack, with a dense water-sky not far distant. My hours for sleep at this camp were occupied in observation, and making a transit profile of the northern coast from Cape Washington eastward.

CAPE LOUIS NAPOLEON.

The next day I started back for the land, and, having a trail to follow and no time wasted in reconnaissance, reached it in one march and camped. Leaving this camp on the 18th, as we were travelling eastward on the icefoot an hour later, I saw a herd of six musk-oxen in one of the coast valleys, and in a short time had secured them. Skinning and cutting up these animals, and feeding the dogs to repletion, consumed some hours, and we then resumed our march, getting an unsuccessful shot at a passing wolf as we went.

Within a mile of our next camp a herd of fifteen musk-oxen lay fast asleep. I left them undisturbed. From here on, for three marches we reeled off splendid distances over good going in blinding sunshine, and

Everywhere along this coast I was impressed by the startling evidences of the violence of the blizzard of a few days before. The polar pack had been driven resistlessly in against the iron coast, and at every projecting point had risen to the crest of the ridge of old ice along the outer edge of the icefoot, and, pouring over this, had descended upon the icefoot in a terrific cataract of huge blocks. In places these mountains of shattered ice were 100 feet or more in height. The old ice in the bays and fjords had had its outer edge loaded with a great ridge of ice-fragments, and was itself cracked and crumpled into huge swells by the resistless pressure. All the young ice which had helped us on our outward passage had been crushed into countless fragments and swallowed up in the general chaos.

CAPE JOSEPH GOODE.

Though hampered by fog, the passage from Cape North to Cape Bryant was made in twenty-five and a half marching hours. At 7 a.m. on June 6 we camped on the end of the icefoot, at the eastern end of the Black Horn cliffs. A point a few hundred feet up the bluffs, commanding the region in front of the cliffs, showed it to be filled up by small pieces of old ice held in place against the shore by pressure of the outside pack. It promised at best the heaviest kind of work, with a certainty that it would run abroad at the first release of pressure. The next day, when about one-third the way across, the ice did begin to open out, and it was only after a rapid and hazardous dash from cake to cake that we reached an old floe, which, after several hours of heavy work, allowed us to climb upon the icefoot at the western end of the cliffs. From here on, rapid progress was made again, three more marches taking us to Conger, where we arrived at 1.30 a.m., June 10, though the open water between Repulse harbour and Cape Brevoort, which had now expanded down Robeson channel to a point below Cape Sumner, and the rotten ice under Cape Sumner, hampered us seriously.

In passing, I took copies of the Beaumont English records from the cairn at Repulse harbour, and brought them back for the archives of the club. They form one of the finest chapters of the most splendid courage, fortitude, and endurance under dire stress of circumstances that is to be found in the entire history of Arctic explorations.

In this journey I had determined conclusively the northern limit of the Greenland archipelago, or land group, and had practically connected the coast south-eastward to Independence bay, leaving only that comparatively short portion of the periphery of Greenland lying between Independence bay and Cape Bismarck indeterminate. The non-existence of land for a very considerable distance to the northward and north-eastward was also settled, with every indication pointing to the belief that the coast along which we travelled formed the shore of an uninterrupted central polar sea extending to the pole, and beyond to the Spitzbergen and Franz Josef Land groups of the opposite hemisphere. The origin of the floebergs and palæocrystic ice was definitely determined. Further than this, the result of the journey was to eliminate this route as a desirable or practical one by which to reach the pole. The broken character of the ice, the large amount of open water, and the comparatively rapid motion of the ice, as it swung around the northern coast into the southerly setting east Greenland current, were very unfavourable features.

During my absence some thirty-three musk-oxen and ten seals had been secured in the vicinity of Conger. July was passed by a portion of the party in the region from Discovery harbour westward, *viâ* Black Rock vale and Lake Hazen, where some forty musk-oxen were secured. During August and early September various other hunting trips of shorter duration resulted in killing some twenty more musk-oxen. The middle of September I started with Henson and four Eskimo to Lake Hazen to secure musk-oxen for our winter supply, it being evident that no ship could reach us. Going west as far as the valley of the Very river, by October 4 ninety-two musk-oxen had been killed. Later nine more were secured, making a total of 101 for the autumn hunting. From the beginning of November to March 6, a large portion of the time was passed by the party in igloos built in the vicinity of the game killed, in various localities from Discovery harbour to Ruggles river.

On April 5 I left Conger with Henson, one Eskimo, two sledges, and twelve dogs for my northern trip. At the same time the remainder of the party, with two sledges and seven dogs and pups, started south for Cape D'Urville and Sabine, to communicate with or obtain tidings of the ship. On reaching Lincoln bay, it was evident to me that the condition of men and dogs was such as to negative the possibility of reaching the pole, and I reluctantly turned back. Arriving at Conger, after an absence of eight days, I found the other party there. It had returned to Conger after an absence of four days, having proceeded one-third of the distance across Lady Franklin bay.

On April 17 I started south with the entire party, and reached the *Windward* at Payer harbour May 6. After a few days' rest, the work of re-establishing caches along the coast northward towards Conger was commenced, and prosecuted till the middle of June. Then, having decided to make Payer harbour my base for the next year, all supplies, and the *Windward's* deckhouse, were landed for my use. On July 3, after several days' sawing, the *Windward* was freed from the ice. July was devoted to walrus-hunting, and after the arrival of the *Erik*, August 4, both ships engaged in the work. Late in August, after an attempt to reach Payer harbour, which was frustrated by heavy ice, I was landed with my party and walrus meat, in a small bight some 12 or 15 miles south of Cape Sabine, from whence I could proceed to Payer harbour in my boats or sledges when opportunity offered.

CAPE AT 83° 50′ N. LAT.

On September 16 I succeeded in reaching Payer harbour, crossing Rosse bay partly by sledge and partly by boat, and going overland across Bedford Pim island. Soon after this my Eskimo began to sicken, and by November 19 six of them were dead. During this time I personally sledged much of the material from Erik harbour to headquarters, and Henson went to the head of Buchanan bay with some of the Eskimo and secured ten musk-oxen. The winter passed quietly and comfortably. Two more musk-oxen were secured in Buchanan bay, and six deer at Etah.

On January 2 work was begun in earnest on preparations for the spring campaign, which opened on February 11. On this day I sent off six sledges, with light loads, to select a road across the mouth of Buchanan bay and build an igloo abreast of Cape Albert. At 9 a.m. on March 6 fourteen sledges trailed out of Payer harbour and rounded Cape Sabine for the northern journey, and at noon I followed them with my big sledge, the "Long Serpent," drawn by a team of ten fine greys. Two more sledges accompanied me. The temperature at the time was –20° Fahr.; the minimum of the previous night had been –38° Fahr. Henson had started on the 3rd, with six sledges and fifty dogs. We joined the others at the igloos abreast of Cape Albert, and camped there for the night. Temperature –43° Fahr. The next day we made Cape D'Urville in temperatures from –45° to –49° Fahr. Here I stopped a day to dry our footgear thoroughly, and left on the morning of the 9th. Two sledges returned from here. Camped about 5 miles from Cape Louis Napoleon. The next march carried me to Cape Fraser, and the next to Cape Collinson. During this march, for the first time in the four seasons that I had been over this route, I was able to take a nearly direct course across the mouth of Scoresby bay, instead of making a long *détour* into it.

One march from Cape Collinson carried me to Cape Lawrence, on the north side of Rawlings bay. The crossing of this bay, though more direct than usual, was over extremely rough ice. Learning from Henson's letter at Cape Lawrence that I had gained a day on him, and not wishing to overtake him before reaching Conger, I remained here a day, repairing several sledges which had been damaged in the last march. Five men, with the worst sledges and poorest dogs, returned from here. Three more marches took us to Cape von Buch, on the north side of Carl Ritter bay, temperature ranging from –35° to –45° Fahr. Heavy going in many places. Two more marches carried us to the first coast valley north of Cape Defosse. I had now gained two days on the advance party. The character of the channel ice being such that we were able to avoid the terrible icefoot which extends from here to Cape Lieber, and my dogs being still in good condition, I made a spurt from here, and covered the distance to Conger in one march, arriving about an hour and a half after Henson and his party. I had covered the distance from Payer harbour to Conger (some 300 miles) in twelve marches.

Four days were spent at Conger overhauling sledges and harnesses, drying and repairing clothing, and scouting the country as far as the Bellows in search of musk-oxen. None were seen, but about a hundred hare were secured in the four days. Temperatures during this time from −40° to −57° Fahr. Seven Eskimo returned from here, taking with them the instruments of the Lady Franklin Bay Expedition and other items of Government property abandoned here in 1883.

On the morning of the 24th I started north with nine sledges. We camped the first night at Depôt B. The next march I had counted on making Lincoln bay, but just before reaching Wrangel bay a sudden furious gale, with blinding drift, drove us into camp at the south point of the bay. Here we were storm-bound during the 26th, but got away on the morning of the 27th, and pushed on to Cape Union, encountering along this portion of the coast the steep side slopes of hard snow which are so trying to men and sledges and dogs. Open water, the clouds over which we saw from Wrangel bay camp, was about 100 yards from our igloo, and extended from there, as I judged, northward beyond Cape Rawson, and reached entirely across the channel to the Greenland coast at Cape Brevoort, as in 1900. Fortunately, with the exercise of utmost care, and at the expense of a few narrow escapes and incessant hard work, we were able to work our sledges along the narrow and villainous

A PRESSURE RIDGE.

icefoot to and around Black cape. The icefoot along this section of coast was the same as was found here by Egerton and Rawson in 1876, and Pavy in 1882, necessitating the hewing of an almost continuous road; but a party of willing, light-hearted Eskimo makes comparatively easy work of what would be a slow and heart-breaking job for two or three white men. Beyond Black cape the icefoot improved in character, and I pushed along to camp at the *Alert's* winter quarters. Simultaneously with sighting the *Alert's* cairn, three musk-oxen were seen a short distance inland, which I went away after and secured. The animals were in poor condition, and their meat furnished a scant meal for my dogs. One march from here carried us to Cape Richardson, and the next under the lee of View point, where we were stopped and driven to build our igloo with all possible speed by one of the common Arctic gales. There was young ice, pools of water, and a nearly continuous water-sky all along the shore.

As the last march had been through deep snow, I did not dare to attempt the English short cut across Feilden peninsula, behind Cape Joseph Henry, preferring to take the icefoot route around it. For a short distance this was the worse bit of icefoot I have ever encountered. By the slipping of my sledge two men nearly lost their lives, saving themselves by a most fortuitous chance, with feet already dangling over the crest of an ice-precipice some 50 feet in height. At the very point of the cape we were obliged to pass the sledges along a shelf of ice less than 3 feet in width, glued against the face of the cliff at an elevation which I estimated at the time as 75 feet above the ragged surface of the floe beneath. On the western side of the cape the icefoot broadened and became nearly level, but was smothered in such a depth of light snow that it stalled us, and we went into camp. The next day we made Crozier island.

During April 2 and 3 we were held here by a westerly storm, and the 4th and 5th were devoted to hunting musk-oxen, of which three were secured, two of them being very small. From here I sent back three Eskimo, keeping Henson and four Eskimo with me. During this time reconnaissances of the polar pack northward were made with the glasses from the summit of the island and from Cape Hecla. The pack was very rough, but apparently not as bad as that which I saw north of Cape Washington two years before. Though unquestionably a hard proposition, it yet looked as though we might make some progress through it, unless the snow was too deep and soft. This was a detail which the glasses could not determine.

On the morning of April 6 I left Crozier island, and a few hours later, at the point of Cape Hecla, we swung our sledges sharply to the right, and climbed over and down the parapet of the icefoot on to the polar pack. As the sledges plunged down from the icefoot their noses were buried out of sight, the dogs wallowed belly-deep in the snow, and we began our struggle due northward. We had been in the field now just a month. We had covered not less than 400 miles of the most arduous travelling in the severest season of the year, in temperatures of from −35° to −57° Fahr., and we were now just beginning our work, *i.e.* the conquest of the polar pack, the toughest proposition in the whole wide expanse of the Arctic regions.

Some 2 miles from the cape was a belt of very recent young ice, running parallel with the general trend of the coast. Areas of rough ice caught in this compelled us to exaggerated zigzags and doubling on our track. It was easier to go a mile round on the young ice than to attempt to force the sledge across one of these islands. The northern edge of the young ice was a high wall of heavily rubbled old ice, through which, after some reconnaissance, we found a passage to an old floe, where I gave the order to build an igloo. We were now about 5 miles from the land.

KANGERDLOOKSOAH CAMP, WHERE PEARY LEFT HIS ESKIMO.

The morning of the 7th brought us fine weather. Crossing the old floe, we came upon a zone of old floe fragments deeply blanketed with snow. Through the irregularities of this we struggled, the dogs floundering almost useless, occasionally one disappearing for a moment; now treading down the snow round a sledge to dig it out of a hole into which it had sunk, now lifting the sledges bodily over a barrier of blocks; veering right and left; doubling in our track, road-making with snowshoe and pickaxe. Late in the day a narrow ditch gave us a lift for a short distance; then one or two little patches of level going; then two or three small old floes, which, though deep with snow, seemed like a God-send compared with the wrenching work earlier. We camped in the lee of a large hummock, on the northern edge of a small but very heavy old floe, every one thoroughly tired, and the dogs utterly lifeless, dropping motionless in the snow as soon as the whip stopped. We were now due north of Hecla, and I estimated we had made some 6 miles, perhaps 7, perhaps only 5. A day of work like this makes it difficult to estimate distances. This is a fair sample of our day's work.

On the 12th we were storm-bound by a gale from the north-west, which hid even those dogs fastened nearest to the igloo. During our stay here the old floe on which we were camped split in two with a loud report, and the ice cracked and rumbled and roared at frequent intervals.

In the first march beyond this igloo we were deflected westward by a lead of practically open water, the thin film of young ice covering it being unsafe even for a dog. A little farther on, a wide canal of open water deflected us constantly to the north-west and then west, until an area of extremely rough ice prevented us from following the lead any further. Viewed from the top of a high pinnacle, this area extended west and north-west on both sides of the canal as far as could be seen. I could only camp and wait for this canal, which had evidently been widened (though not newly formed) by the storm of the day before, to close up or freeze over. During our first sleep at this camp there was a slight motion of the lead, but it was still impracticable. From here I sent back two more Eskimo.

Late in the afternoon of the 14th the lead began to close, and, hastily packing the sledges, we rushed them across over moving fragments of ice. We now found ourselves in a zone of high parallel ridges of rubble ice covered with deep snow. These ridges were caused by the successive opening and closing of the lead. When, after some time, we found a practicable pass through this barrier, we emerged upon a series of very small but extremely heavy and rugged old floes, the snow on them still deeper and softer than on the southern side of the lead. At the end of a sixteen-hour day I called a halt, though we were only 2 or 3 miles north of the big lead.

During the first portion of the next march we passed over the fragments of very heavy old floes, slowly moving eastward, and were frequently obliged to wait for the pieces to crush close enough together to let us pass from one to the other. Further on I was compelled to bear away due east by an impracticable area, extending west, north-west, north, and north-east as far as could be seen, and just as we had rounded this, and were bearing away to the north again, we were brought up by a lead some 50 feet wide. From this time on, one day was much like another, sometimes doing a little better, sometimes a little worse, but the daily advance, in spite of our greatest efforts, steadily decreasing. Fog and stormy weather also helped to delay us.

I quote from my journal for April 21—

"The game is off. My dream of sixteen years is ended. It cleared during the night, and we got under way this morning. Deep snow. Two small old floes. Then came another region of old rubble and deep snow. A survey from the top of a pinnacle showed this extending north, east, and west, as far as could be seen. The two old floes over which we had just come are the only ones in sight. It is impracticable, and I gave the order to camp. I have made the best fight I knew. I believe it has been a good one. But I cannot accomplish the impossible." *

A few hours after we halted, the ice to the north commenced like the sound of heavy surf, and continued during our stay at this camp. Evidently the floes in that direction were crushing together under the influence of the wind, or, what was perhaps more probable from the long continuation of the noise, the entire pack was in slow motion to the east. A clear day enabled me to get observations, which showed my latitude to be 84° 17′ 27″; magnetic variation, 99° W. I took some photos of the camp; climbed and floundered through the broken fragments and waist-deep snow for a few hundred yards north of the camp; gave the dogs a double ration; then turned in to sleep, if possible, for a few hours, preparatory to returning.

We started on our return soon after midnight of the 21st. It was very thick, wind from the west, and snowing heavily. I hurried our departure in order to utilize as much of our tracks as possible before they were obliterated. It was very difficult to keep the trail in the uncertain light and driving snow. We lost it repeatedly, when we would be obliged to quarter the surface like bird-dogs. On reaching the last lead of the upward march, instead of the open water which had interrupted our progress then, our tracks now disappeared under a huge pressure-ridge, which I estimated to be from 75 to 100 feet high. Our trail was faulted here by the movement of the floes, and we lost considerable time in picking it up on the other side. This was to me a trying march. I had had no sleep the night before, and to the physical strain of handling my sledge was added the mental tax of trying to keep the trail. When we finally camped it was only for a few hours, for I recognized that the entire pack was moving slowly,

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* It is to be understood that the use of the word "impossible" here refers to the size of the party which I then had, and the severe handicap under which I had been compelled to work. With a party starting fresh from Cape Hecla in February instead of April, and large enough to allow me to make a different disposition of the sledges and method of advance, the rate of advance over the same ice-conditions could be at least doubled.

and that our trail was everywhere being faulted and interrupted b new pressure-ridges and leads in a way to make our return marc nearly, if not quite, as slow and laborious as the outward one. Th following marches were much the same. In crossing one lead I narrowl escaped losing two sledges and the dogs attached to them. Arrived the "grand canal," as I called the big lead at which I had sent tw Eskimo back, the changes had been such as to make the place almo unrecognizable.

Two marches south of the "grand canal," the changes in the ice ha been such, between the time of our upward trip and the return of m two men from the canal, that they, experienced men as they wer in all that pertains to icecraft, had been hopelessly bewildered, an wandered apparently for at least a day without finding the trail. Aft their passage other changes had taken place, and, as a result, I set compass-course for the land, and began making a new road. In th next march we picked up our old trail again.

Early in the morning of the 22nd we reached the second igloo ou from Cape Hecla, and camped in a snowstorm. At this igloo we wer storm-bound during the 27th and 28th, getting away on the 29th in the densest fog, and bent upon butting our way on a "bee-line" compass-course for the land. Floundering through the deep snow and rough ice, saved from unpleasant falls only by the forewarning of the dogs, we reached Crozier island after a long and weary march. The band of young ice along the shore had disappeared, crushed up into confused ridges and mounds of angular blocks. The floe at the island camp had split in two, the crack passing through our igloo, the halves of which stared at each other across the chasm. This march finished two of my dogs, and three or four more were apparently on their last legs. We did not know how tired we were until we reached the island. The warm foggy weather and this last march together dropped our physical barometer several degrees.

As we now had light sledges, I risked the short cut across the base of Feilden peninsula, and camped that night under the lee of View point. Four more marches carried us to Conger, where we remained three days, drying clothing and repairing sledges and giving the dogs a much-needed rest. Leaving Conger on May 6, eleven marches brought us back to Payer harbour on May 17. A few days after this I went north to complete the survey of the inner portions of Dobbin bay, being absent from headquarters some ten days. Open water vetoing a trip which I had planned for June up Buchanan bay and across to the west coast of Ellesmere Land, the remainder of the time was devoted to assiduous hunting, in order to secure a supply of meat for the winter in the contingency of no ship arriving.

On August 5 the new *Windward* sent north by the club, and bringing to me Mrs. Peary and my little girl, steamed into the harbour. As soon as people and supplies could be hurried aboard her, she steamed across the sound to the Greenland side. Here my faithful Eskimo were landed, and after devoting a week or so to the work of securing sufficient walrus to carry them in comfort through the winter, the *Windward* steamed southward, and, after an uneventful voyage, arrived at Sydney, C.B., on September 17, after an absence of four years, three months and ten days.

The character of the North Greenland coast changes with startling abruptness and completeness at Cape Morris Jesup. The ragged coast-line from Cape Bryant to Cape Jesup, almost utterly devoid of life, and made up of precipitous capes and islands, with deep water close to, and the polar pack driving against their bases, gives way suddenly to a coast-line of sweeping curves, fronted by a wide zone of shoal water, and rising through a low foreshore to mountains a few miles inland. This coast is inhabited by a fauna practically the same as that of other Arctic lands several hundred miles further south.

This northern land differs from the Greenland shores from Cape York northward in that it is not an elevated tableland disappearing a short distance inland under the obliterating curves of the interior ice-cap, but is a region of mountain peaks, sharp and even ragged, on the slopes and in the valleys of which are disconnected *névés* that give birth to numerous glaciers of not great magnitude. I am under the impression that the Roosevelt range is a continuation of a circumpolar crest or ridge, of which the United States range in northern Grinnell Land is a portion. The motion of the sea-ice off this coast is sensibly eastward. A continued south-westerly wind will, at any season of the year, form a temporary polynia of considerable size at the northern end of Robeson channel. The "Grand canal" referred to in my paper quite probably marks the northern edge of the shoal which protrudes from the north coast of Grinnell Land.

Wherever we travelled in Ellesmere and Grinnell Lands traces of Eskimo were found as far north as Lincoln bay. Three of these finds were particularly interesting, viz. remains of two kayaks buried in the gravel just south of Carl Ritter bay (these kayaks of a type entirely unknown to the Whale sound and west side natives, their frames fastened together with strands of whalebone); two igloos, well up the bluffs in "The Bullows," at the western end of Discovery harbour, which my Eskimo thought must have been used at a time when the Bullows was an arm of the sea; a place near head of Sawyer bay, where the Eskimo had chipped flints for arrowheads.

On the Greenland coast no traces of Eskimo were seen, though I doubt not they would be found later in the season, with less snow on the ground, between Thank God harbour and Cape Bryant, and again from Cape Jesup south-eastward. Between Cape Bryant and Cape Jesup the ragged, precipitous, and utterly barren islands and headlands present no places and no inducements for natives to camp except in the heads of the bays.

Bones of the whale were found as far north as Cape Defosse. At Cape Field, in Princess Marie bay, was nearly an entire skeleton. The capture or finding of this animal had evidently been the reason for the existence of a village of several igloos on the cape. Bones of the whale had been used in the construction of the houses.

FUTURE PLANS.

I have been asked to say something about my future plans. My plan of campaign requires but a few words. It contemplates the utilization of the utmost efforts and fullest resources of the Whale sound Eskimo; the use of dogs for traction power; a ship which shall drive me to the northern shore of Grinnell Land; and a refinement of methods and equipment (the result of years of experience) which will enable me to cover the distance from Grinnell Land to the pole and back between early February and June. My polar creed can be quickly stated. It contains three articles. It is held by many Americans beside myself, from that splended, vigorous, typical American personality who stands at our head, down.

(1) *The north pole should be attained.* As a matter of valuable accession to geographical knowledge, as a matter of prestige, it is a prize worth the utmost effort. The struggle for it has been going on nearly four centuries. Its attainment will be the sign of man's final conquest of the globe. Its non-attainment is to-day a reproach both to our boasted civilization and our alleged abilities.

(2) *The only practical route to the pole is the Smith sound route,* offering as it does a land base 100 miles nearer the pole than any other route, a less actively moving ice-pack, a wider base to which to return, and a practicable and well-known line of retreat to lower latitudes in the event of mishap to the ship.

(3) *The attainment of the pole is peculiarly an object for American pride and patriotism.* The North American world segment is our home, our natural ultimate destiny. Its bounds are the isthmus and the pole. We are negotiating for the isthmus; we must find and mark the pole. More than this, we want the pole because it is the pole, and because you, and we, and practically all the other civilized nations of the world have been trying for it for nearly four centuries, and have not got it yet, and because to win it will be the crown of these four centuries of effort and sacrifice and splendid heroism.

Before the reading of the paper, the PRESIDENT said: This evening we have to welcome our friend and associate and Gold Medallist, Commander Peary. It is seven years since he gave us that most interesting paper describing his famous land journey across Greenland. Since that time he has been for four and a half years pegging away at that terrible ice, forcing his way to places where human foot never trod before, and now we, with great pleasure, find him looking as well as he was when he left us, and we rejoice to welcome him to this meeting to-night. I will now ask Commander Peary to address you.

After the reading of the paper—

Admiral Sir LEWIS BEAUMONT said: I think everybody must feel that we are indebted to Commander Peary for a most interesting and instructive lecture. I know that those who have come here, quite willing to receive him with a great deal of appreciation, must remember that on a former occasion he interested us even more than we expected; I think to-night he has surpassed himself. I am glad to say that there is no jealousy amongst Arctic explorers, and if there is any one here to-night who is ready to give him the meed of praise he deserves, it must be those who have had the privilege of being in those regions themselves. I think you will agree that to be four years in the Arctic Region is in itself a wonderful test of manhood and endurance, and to have accomplished, in addition to those four years, the extraordinary and wonderful journeys which we have just been told of, makes a record in Arctic history which stands almost unsurpassed. We have ourselves fellow-countrymen in the Antarctic Regions whom we are proud to think are doing their duty, and are succeeding. It yet remains to be known what they actually have done, but in the mean time, we must accord a full measure of praise and admiration to the wonderful perseverance and dogged courage with which Commander Peary has not only remained for four years this time, but has gone over and over again to the attack of these inhospitable regions and faced these trying and difficult journeys, these long winter nights, and at last reached one of the goals of his ambition—the northern point of Greenland. You may feel with me how much interest I have felt in these descriptions, when you know that I belonged to the English expedition which went into these same regions, and travelled over the very sites which Commander Peary has described in his long journey, passing the Black Horn cliff and making for Cape Britannia—which I was never fortunate enough to reach—while he has at last seen the unknown north, and planted the flag of the United States on the northern point of the continent of Greenland. It is, perhaps, not quite evident to those who have listened to the lecture to-night, that the results of Commander Peary's work are really more extraordinary and more deserving of admiration than one would suppose, without knowing the fact that he has had to commence something like 400 miles behind or further south than every one else who has been there—that is to say, than the well-equipped expeditions which have preceded him in recent times. It may interest you to know that the Hall Expedition in the *Polaris*, which comes first, though perhaps not very well equipped, was very fortunate, reaching Fort Conger without difficulty —that is to say, carrying its base up to 81° 47′ or 82°, and therefore was able to start from a point much nearer to the pole. The next expedition was the English expedition of 1875, which first reached Discovery harbour, where it left one of its ships, while the other, the *Alert*, went on to a point in lat. 82° 27′, the winter quarters of which were called Floeberg Beach; from there a party was able to make a journey north which resulted in reaching that point in the polar pack shown on the map, which even now Commander Peary has only just passed. It was a wonderful exploit, which met with all the difficulties we have heard of from Commander Peary, and that point was reached by Commander Markham, now Sir Albert Markham. The next expedition was the American expedition under Major Greely, now General Greely, who took up his position in Discovery harbour, and built the fort which he called Fort Conger, and from there he made his explorations and one of his officers was fortunate enough to make this long journey past the point I was able to reach, making his last station at what is now called Cape Lockwood, and which has been passed by something more than 100 miles by Commander Peary. So you see that each expedition has, as it were, reached beyond the limits of the last one. I ought, in fairness to the English expedition, to explain that it was the last expedition ever undertaken with manned sledges, instead of sledges drawn by dogs. Up to that time the sledges had been drawn by men. They were heavy, and carried immense loads, because it was necessary that the men should have food, clothing, and protection from the weather at night. You will remember that they were all Englishmen—they were not Eskimo; they required shelter and food, so that the sledges drawn by men had great limitations. Directly the English expedition came home it was seen that the Americans had been right in making the long journeys with dogs, and from that time men have not drawn the sledges, but dogs have been used, and it is owing to that change in the system of exploration that great journeys have been successfully accomplished over the extent of difficult ice which exists to the north of Smith sound. Well, to come back to the point which made this explanation necessary. I want you to appreciate how great was the work done by Commander Peary; that, starting from halfway down Smith sound, 400 miles from the starting-point of the three other expeditions, he has accomplished more than they. I consider it is due first to the man himself, who has shown himself to be every inch a man, not only when such work had to be done, but also when the time of trouble and sorrow came, and he took care of his people at their dying moments, and not only took care of them, but saw that the extraordinary customs of the Eskimo should not rob those who were left of their children, and laid to rest those who died. I think the tenderness of those acts in the region where the hardness of life rather tends to make hardness of heart, is very much to the credit of Commander Peary. I need not say that what Commander Peary has told you of the future simply comes out of his great enthusiasm, which, it would seem, has not been daunted by all that he has gone through. It has been thought by those in England, who were aware of the difficulties of that route, that the pole was not attainable through the Smith sound passage. You have seen for yourselves the almost insurmountable difficulties that are opposed to advancing north over the pack itself. But Commander Peary has really become the expert in the matter, and we ought to give great consideration to his views. Another thing is that we have hitherto looked upon the attack of the polar pack from the point of view of Europeans undertaking it in more or less the form of a Government expedition, or, at all events, a large expedition, which throws an immense responsibility upon its commander and which to a very great extent hampers the freedom of his action. Now, in this case Commander Peary undertakes to do the attack by himself with dogs, which, of course, are absolutely necessary, and with the assistance of Eskimo—which is already half the battle won. Compared with a European who goes there for the first time, an Eskimo is worth three times more in dog-sledging; and more than that, Commander Peary goes there with a knowledge of the work to be done, and of the way to do it, which is unrivalled, and therefore, if it is possible for him in his ship to reach the furthest point that has been reached by a ship—that is, Floeberg Beach, 82° 27′, I believe that, with the courage which he has shown, and with the help of those Eskimo, who seem his very children, there may be a possibility of success, and no one will be more glad of it than those who have been there and seen the difficulties to be overcome. No one will welcome the fact that he has reached the pole more than this audience, which has received him so cordially to-night. I would like to add that there is an extraordinary feature, a very satisfactory feature, in his prospects from the point of view of one who has been an

Arctic explorer, and that is that in America there appears to be money ready and forthcoming to help him on his way. Well, we have countrymen who are working away south in the Antarctic, and who may want money themselves some day. Let us follow the example of those who are ready to help exploration, to help the men who are ready to risk their lives in the interest of science, and in the interest of that feeling which Commander Peary has so well described, the desire to conquer the world, and not allow any part of its area to remain undiscovered.

Colonel FEILDEN: In deference to our President, I rise to say a few words, but after the speech of Admiral Beaumont I have very little to add. I presume that our President would wish me to refer more especially to the natural history and scientific results of Commander Peary's Expedition. We should be, I think, very exacting if we expected Commander Peary, in the short space of an hour in which he had to condense his four years of Arctic travels, to give us any special reference to natural science. All those who are acquainted with Commander Peary's work must be well aware of the great value of the observations he has made in the Arctic Regions on his former expeditions, and I have not the slightest doubt that when his later observations are laid before the public they will be found equally valuable. Commander Peary, however, has incidentally referred in his paper to a most interesting problem, and that is, that on the furthest apex of the great island continent of Greenland, the nearest point to the north pole—in fact, only a distance of 360 geographical miles—he tells us he met various species of animals, even large flocks of ruminants, that ancient musk-ox, one of the most interesting animals on the Earth. Once it inhabited Great Britain, and its remains are found in the Pliestocene deposits of Europe and Siberia. The reason I draw attention to the fact of large mammals existing there is that it must be an object-lesson to many of our geologists who write of the total obliteration of life during the Glacial epoch. We see under the most glacial circumstances that can exist that life has not been obliterated, but it is able to get along apparently under the most adverse experiences. There are many points in Commander Peary's paper this evening that I could refer to, but I am afraid some are argumentative; but there is one very striking point, in which he tells us of the pressure-ridges against the seashore where the ice is forced up 100 feet against the shores and cliffs of the north part of Greenland. Now, when we think of the pressure that is required to force millions of tons of ice against the shore, moved by tide and winds with enormous velocity, it is apparent that there is no other power in nature except the volcano and the earthquake at all comparable to that of floating ice when pushed on the shore, and there are many speculations interesting to geologists to be derived from the consideration of the effects of floating ice. Therefore I think Commander Peary, in his paper, has given us two very interesting problems to consider—one the mammalian life existing within a short distance of the north pole; the other the great effects of floating ice on land surfaces.

The Hon. J. H. CHOATE, the American Ambassador: In the unfortunate position that I occupy, it seems to be thought that I can address any audience upon any subject. But, fortunately for you, we have something to-night of which I have no knowledge. Admiral Beaumont rather hesitatingly said that under favourable conditions there was a possibility that Commander Peary might reach the north pole. That is not the way I look at it. I put it much more briefly and tersely than that. I take the American view that of course he will get there, with such dauntless courage, such absolute determination, such earnest hope, and such magnificent experience as he has already had in the polar region. All America is very proud of Commander Peary. They have absolute faith in him; they have faith, from what he has already accomplished, that he will very soon finish the job, and so, with head of the Sandia ravine at Cuyo-cuyo to my furthest point in the Tambopata forests includes without exception the grandest and most beautiful scenery I have ever seen. Its natural products consist of chinchona bark, caoutchouc, vegetable gums, and excellent timber. Coca, coffee, and fruit trees are cultivated, and the cultivation may be extended almost indefinitely. The Inambari flows through a very rich auriferous region.

The expedition to explore the Tambopata last year consisted of the commissary, Don Juan Villalta, an engineer, a medical officer, a botanist, and a naval observer named Stiglich. Starting from Sandia, the expedition followed in my footsteps for the first 40 miles, and then pushed northwards through the forests to the head of canoe-navigation on the Tambopata. Here a station was formed, and named after me Port Markham. The expedition then descended the river in canoes to its junction with the Madre de Dios, where another station was established, and named Port Maldonado, after one of the earliest explorers of the great river, whose work was done half a century ago. A road is to be made from Port Markham to Sandia, and there will soon be telephonic communication. Careful meteorological observations were taken throughout the time, from May to October, 1902, and *Alferez de Fragata* Stiglich, with chronometer and sextant, fixed several positions, including Sandia.

In 1893 the Bolivian Colonel Pando, now president of that republic, had ascended the Madre de Dios from the Beni and reached the mouth of a stream which he took to be the Inambari, where the width was 325 yards, and depth 15 fathoms; and he was followed in 1894 by Dr. Ramon Paz.[*] In the same year Colonel Muños continued the exploration of the river system, and found cause for supposing that the river reached by Colonel Pando was not the Inambari, but the Tambopata.[†] Colonel Pando resumed his explorations in 1897, and confirmed the supposition of Colonel Muños, but the preliminary report issued by the Geographical Society of La Paz in 1898 leaves the routes followed by the colonel and his assistants somewhat uncertain. The journey of a French traveller, M. Viellerobe, also in 1898, added somewhat to our knowledge, as the position of the mouth of the Inambari was roughly fixed and the river ascended some 25 miles.[‡] The Peruvian Fluvial Highway Committee entrusted the discovery of the course of the Inambari, from its headwaters to its junction with the Madre de Dios, to the engineer Don César Cipriani. The report of Señor Cipriani on the valley of San Gaban as a suitable region for colonization, on the caoutchouc industry, and on the river flowing through one of the richest gold-producing countries in the world, is of considerable value.

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[*] *Geographical Journal*, vol. vii. p. 188.

[†] *Ibid.*, vol. x. p. 443.

[‡] *Ibid.*, vol. xiv. p. 214.

The fourth expedition from Eten on the coast to the upper Marañon as far as the Pongo de Manseriche and San Borja was conducted by the engineer Don Eduardo de Habich. His report has also been received, and is full of interest.

The reports are illustrated by photographs and by a series of maps based on positions fixed astronomically. They include accounts of the botany, and more elaborate reports on the diseases and climate of the regions, and on sources of food-supply.

These *montañas* to the east of the Andes, on the parallels between Cuzco and Lake Titicaca, are of deep interest. To some extent the forests were explored and even partially settled by the Incas. But practically, with the exception of the deep ravines on the eastern side of the Andes, they remained unknown to the Spaniards in colonial times. Much has been done, on the lower waters, by the Bolivians in recent years. Now the upper courses are being discovered and settled by Peruvian explorers. The settlement of these highly productive forest regions will, in the time to come, bring wealth and prosperity to Cuzco, the sacred city, and the dream of my heroic old friend, Father Bovo de Revello, will be realized. Meanwhile the Committee of Fluvial Highways, and the explorers who have worked so zealously and so diligently, deserve our hearty congratulations for the good geographical work they have achieved.

A map is necessary to make these explorations in a previously unknown part of South America clear and intelligible.

THE ALASKA BOUNDARY.*

By Colonel Sir T. H. HOLDICH, K.C.M.G., K.C.I.E., C.B.

In this month's number of the *Journal* will be found a map illustrating the main geographical features of the strip of territory which formed the subject of the Alaskan boundary dispute, a dispute which, in some of its chief contentions, forms a curious analogy to that which lately existed between Chile and Argentina in Patagonia.

Some little time ago the Argentine expert, Dr. F. P. Moreno, drew attention (in a paper which he read before the Society) to the general similarity in geographical conformation between the northern and southern Pacific coasts of America, so that it is not surprising that, so far as those issues are concerned which possessed a geographical bearing, there should be points of similarity in the contentions and the award.

In both cases the treaties were framed on an uncertain geographical basis, inasmuch as no accurate maps existed of the territories under dispute. In both cases it was found that when the true geographical facts were known, the terms of the treaty admitted of divergent interpretation; and in both the arbitration tribunal has been compelled to fall back on the spirit and intention of the agreements from the consideration of the actual text. This has demanded a review of the political situation at the time the treaties were made, and a careful analysis of the extent of geographical knowledge which previously existed of the disputed areas.

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* Map, p. 724.

It will be remembered that the South American treaty contemplated an ideal boundary which should at the same time be a main range, or mountain feature, and also a main water-parting, or divide. These two conditions being found incompatible in nature, an appeal was made to British arbitration to decide between them. Geographical facts did not fit the text of the agreement, and arbitration was the natural sequel of the provision made in the treaties, that in case of certain unexpected developments in the unknown topography of the Patagonian Andes, resort should be had to a concensus of expert opinion. The experts did not agree, and then it was that an independent tribunal was sought for. The tribunal could no more reconcile the existing geographical conditions to the text of the treaty than could the experts; and thus it was that the political motive, the intention, of the treaty finally demanded the most careful analysis. Now, if there was one feature in the "motive" more clearly indicated than another, it was the understanding that Chile was to retain absolute command of the western coast-line, to the exclusion of Argentine ports and settlements. This, then, became one (amongst others) of the guiding principles of the award, and a line was eventually defined which gave it full effect.

Within a year the same principle has received a new application under almost parallel circumstances. Once again, in the Alaskan arbitration, has the spirit of the treaty rather than its text shaped the final decision of the arbitrators. The original object of Russia to have "a fixed frontier, beyond which the English traders could not settle," rather than the literal interpretation of such terms as "coast-line" or "shore," has decided the result. Canada is "cut off from access to the sea over more than 4° of latitude, and, in particular, she is deprived of access to the Lynn canal to Yukon territory, the most convenient, and, at some seasons of the year, the only mode of access." Small wonder, then, that Canada is disappointed; but nobody who knows Canada can doubt that she will accept the disappointment with dignity and courage. She herself cannot possibly doubt the spirit of judicial fairness which has resulted in a British tribunal deciding against itself—for British and Canadian interests are one and the same, as Canada very well knows.

A geographical feature in the award of much interest is the position of the four islands at the mouth of the Portland channel, two of which have been awarded to the United States, and two to Canada. The position of these islands may be studied on the Admiralty chart and in the valuable series of maps which have been presented to the Society by the Hon. Clifford Sifton. There is nothing in their geographical distribution which can enable us to form any conclusion as to the very divergent views expressed on their value by British and Canadian arbitrators. The verdict of the former is that Kannagunat and Sitklan (the two western islands) are of no importance; of the latter, that they are the "two which possess strategic value." If they are of no importance, the United States would hardly have made a point of claiming them. The fact that they are to the seaward of the islands Wales and Pearce certainly does indicate that they can to a certain extent neutralize the strategic value of the latter.

More than ever has it become apparent that a carefully constructed dictionary of geographical terms is a necessity which is pressing. Every boundary dispute which arises brings to light divergent interpretations of terms which we have been accustomed to regard as bearing a well-defined and permanent meaning. In this particular instance it is "coast-line," "shore," and "ocean" that face us with ambiguous limitations and indefinite extension. Are inlets a part of the ocean? Rivers are not so, we know; but where does a river end and an inlet begin if there is no delta or bar? Does the accident of an island being close to the "shore" of the mainland (when does land become "main," by the way?) make any difference as to the "oceanic" character of the straits between them? It would be quite impossible to frame a dictionary which would be absolutely comprehensive; but much may be done, and is, we believe, now being done, by literary experts connected with the Society to ensure a trustworthy reference for geographical terminology. It is much wanted.

THE REPUBLIC OF PANAMÁ.

By Colonel G. E. CHURCH.

ANOTHER turn of the historic kaleidoscope, and this time the *trait d'union* between North and South America is an independent state. What are the physical characteristics, the geographical advantages, the prospective means for existence possessed by this newly fledged commonwealth?

Its south-eastern boundary, if the old departmental limits be maintained, will follow the Serrania del Darien, which is the *divortium aquarum* between the basin of the river Atrato and its estuary and the valley of the Tuira, which drains into the Gulf of Panamá. The line commences in the little bay of Aguacate or Octavia, in front of point

Mazo or Morroquemado, and thence runs north-north-east, and then north along the summits which separate the rivers that flow to the Pacific from those which run to the Atlantic. Reaching the headwaters of the Juradó, it turns west towards the heights of Aspave. It then follows, generally in a north-east direction, the divide between the gulf of San Miguel and the river Atrato until it reaches the ocean entrance to the Gulf of Urabá, where it diverges north-west to the headwaters of the river Tarena, the course of which, until it empties into the Gulf of Urubá, serves as the most northern section of the boundary in question.*

The frontier with Costa Rica will, according to the award of President Loubet in 1900, start from Cape Mona, on the Caribbean sea, and enclose, on the north, the basin of the river Tarire (the lower course of which is sometimes called the Sixola), and then, by the watershed between the Atlantic and Pacific (which is the narrow-crested Cordillera of Talamanca), south-easterly to 9° S. lat.; thence, it will take a southerly direction and follow the divide between Chiriquí Viejo and the tributaries of the Gulf of Dulce, and terminate at Point Burica, on the Pacific ocean.

A great river, the Atrato, flows in a deep gorge northward into the Gulf of Urabá or Darien, and separates the "Occidental Cordillera" of Colombia from the outlying parallel coast range, washed by the waves of the Pacific ocean, and known as the Sierra de Baudo. This is generally low, its highest peak being only 6000 feet above the sea. Its average elevation is from 2600 to 3300 feet, and its lowest depressions from 1000 to 1600. It is a wild chaos of ridges, highlands, and spurs, terribly ravined by torrential rains, thickly forested, and rendered almost impassable by an infinite number of rivers, brooks, and tropical swamps and jungles—a pestiferous region uninviting as a home for man.

In the latitude of the Gulf of Urabá, the extension of the Sierra de Baudo pushes into the isthmus of Panamá, on the Pacific side, as far as the mouth of the river Bayamo or Chepo, where it completely disappears. *En route*, it breaks down to give place to the Bay of San Miguel and its tributary river system of the Tuira. South-east of this bay is a low *massif* called the Altos de Aspave, and north-west of it another culminating height, broadly spurred and counterforted, which connects by a transverse ridge with the low range which overlooks the Gulf of Darien.

The Altos de Aspave throws off, to the north-east, the Serrania del Darien, which crosses from the Pacific coast to the mouth of the Gulf of Urabá. Thence it skirts the Caribbean coast as far as Puertobelo, occasionally, for long distances, rising from the seashore in bold escarpments. Its principal summits are from 500 to 2700 feet above the sea.

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* See Perez, 'Geografia Fisica de los Estados Unidos de Columbia.'

At the Chagres river, that *bête noire* of the Canal Company, the Sierrania del Darien completely breaks down, and the summit height between the two oceans is but 300 feet above sea-level. With the exception of the interoceanic water-divide in Nicaragua, which is 153 feet, it is the lowest break in the Andean and Rocky mountain chain between the straits of Magellan and northern Alaska.

The orographic system of the western half of the isthmus of Panamá is bolder and better defined than that of the eastern portion. The region has a broad backbone ribbed by numerous counterforts, but occasionally broadening into complex belts of highlands and isolated *cerros*. From the Costa Rica frontier, the range takes the name of Sierra de Chiriquí, then Veragua, and afterwards is known as the Sierra de Panamá. In the first is the extinct volcano of Chiriquí, 11,000 feet * elevation above the sea, but the entire sierra has an average altitude of 6500 feet. The Sierra de Veragua presents us with the dome of Santiago, which rises to 9275 feet, while the Tuta reaches 5000 and the Santa Maria 4600. The Sierra de Panamá seems to be thrown broadcast into disorderly fragments without law or regularity, and its summits nowhere exceed an elevation of 1600 feet.

West of Montijo bay, on the Pacific side, a broad and massive mountain outwork forms the peninsula of Las Palmas, and between that and the bay of Panamá lies the great peninsula of Azuero, which shows a capricious, distinctive orographic system of highlands and *sierras*. Its bold headlands, which overlook the ocean, rise to an altitude of 3000 feet.

About 150 short rivers flow to the sea from the northern side of the isthmus, and over double that number drain its Pacific slope. The largest and most important is the Tuira, which rises in the Pirri mountains just north of the Bay of San Miguel, and empties into this. The Tuira is navigable for river schooners as far up as the first Spanish settlement, Santa Maria del Real; but, owing to the bars, they cannot ascend to Pinogava, which is the highest point reached by the tides. During the dry season, the river-bed above tidewater is a succession of rapids, beyond which the river dwindles into a small stream. The marks on the trees indicate a rise of 16 feet during the wet season, when the volume of water carried by the Tuira and its eleven main tributaries is immense. Its principal affluent is the Chucunaque from the north. It is nearly as large as the Tuira itself.

The Bayamo, or Chepo, rises in the same knot as the Chucunaque, but flows north-west and then west and south until it discharges into the Gulf of Panamá. It is about 150 miles long, and it is claimed that 120 miles of its course can be navigated by rafts and small craft. It has a wide estuary, the entrance to which has a bar with but 2 feet of

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* 'Nueva Geografía de Colombia,' F. J. Vergara y Velasco.

water at low tide. The remaining streams, on the Pacific side, are short and torrential and of little value, even for canoe-navigation, except in the immediate vicinity of their mouths.

On the Caribbean slope of Panamá there are but two of its many rivers which merit attention, as offering some advantages as commercial outlets for the districts they drain. These streams are the Chagres and the Teliri, known now as the Tarire in the decision of the boundary-line dispute between Colombia and Costa Rica. The Chagres, a historic waterway ever since the discovery of the isthmus of Panamá by Colombo, flows into the Caribbean Sea a little to the west of Puertobelo. It has a bar on which there are 11 feet of water, just outside the Laja reef, through which there is a passage 70 feet wide with 14 feet of water. The Chagres is navigable for boats to within 14 miles of the Pacific, and is tame or fierce according to the season. In the dry one, it is a deep ditch with a few feet of muddy water at the bottom, but when the saturated clouds burst over its drainage area of 1000 square miles, and pour into it, at times, a uniform depth of 7 inches of water in a day, the river rises over 40 feet in twelve hours, and carries with it, in its torrential race to the sea, a vast mass of tropical, arboreal rubbish, clay, mud, and detritus which it receives from its swollen tributaries. It will be extremely interesting for the engineering and financial world to watch the coming contest between the Chagres river and the United States Treasury. In comparison to the Chagres, the San Juan river of Nicaragua is a plaything.

The Tarire, the mouth of which is in lat. 9° 34′ 14″ N., runs along the southern base of the great eastern counterfort of the Talamanca-Chiriquí range, through a spacious, undulating wooded valley of 100 to 150 square miles area, having low grounds which are sometimes dry and at others swampy. Its Urén branch rises on the north-east slope of the Pico Blanco, the view from the summit of which is said to be "incomparably more extensive" than that from the crest of the Costa Rica volcano of Irazú. The Tarire is navigable for light-draft steamers for 15 miles up, but, from the Urén to Gule, there are twenty-six rapids and numerous snags. Boats carrying half a ton of goods ascend to Sapurió, 1½ miles up the Urén. Between the Tarire and the small river Tilorio further south is the crooked, narrow, and deep estuary called the Laguna de Sansán, an ancient affluent of the Tilorio, full of sharks, alligators, and fish. It receives a little stream called the Dalni, which drains an impassable swamp. South-east of and near the Tilorio is the Boca del Drago, one of the entrances to Almirante bay.*

Panamá has many bays and ports on both oceans, but the greater part of them seem to be the undisturbed home of silence and primeval solitude. There is no accessible country behind them which offers an easy field for development. He is a bold pioneer who dares to throw down the gauntlet to nature in Panamá. There she displays her forces with magnificent *abandon;* the very ocean-margin is a wall of vegetation; nearly every swamp, hill slope, mountain-side, and gorge is densely packed with growth of tree, shrub, vine parasite, and grasses, forming a tangled jungle, sweating with the effort to maintain existence under the vertical rays of a tropical sun. The view is beautiful from the deck of a vessel, and no wonder that Luiz Colombo selected a part of "Castilla del Oro" as his fairyland, where his imagination might revel to the full, but which, unhappily, could yield him no other satisfaction. Four centuries have passed since he received his grant of ducal Veragua, and although it is within easy touch by sea with North America, it remains as the great Colombo discovered it, and as it was when for centuries it was the buffer region between Aztec and Ingarial civilization, so called. With the exception of bananas, no crop could be planted which would pay for clearing the lands of such a region, and keeping them cleared; and even bananas would not flourish sufficiently well if cultivated at an altitude exceeding 1500 feet above the sea. However numerous the ports and bays of Panamá on the Atlantic side, it is probable that many more centuries must pass before they become of any marked importance as commercial centres.

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* See "Costa Rica," by G. E. Church, *Geographical Journal*, 1897.

Starting from the Costa Rica boundary, the first great well-protected sheet of water is Almirante bay, which in reality is the north-western prolongation of the laguna of Chiriquí. Together they form a vast sheet of water. The former is 13 miles long from east to west, and varies in breadth from 2 to 13 miles. Its many harbours offer secure anchorage to ocean-going ships of the largest class, which may often moor alongside the shore. A low ridge of hills borders its southern side, in some places rising boldly to several hundred feet elevation, and 2 miles inland, reaching an altitude of 1700 to 2000 feet. The bay contains many large and small islands. Its main entrances from the sea are the Boca del Drago and the Boca del Toro, the former very tortuous, but having a depth of 9 fathoms of water; the latter offers 5 fathoms, but the channel is only a quarter of a mile wide, and bordered by coral reefs. The latter entrance gives its name to a small Colombian settlement supported principally by banana cultivation, the product being shipped to the United States.

The laguna of Chiriquí is 32 miles long and 12 wide, narrowing to 5 miles at its south-eastern extremity, and 10 at its north-western. Vessels of any draft may enter it from the ocean by the Boca del Tigre by an 8-fathom channel, and find ample security in 15 to 20 fathoms of water. The eastern and southern shores are low and swampy for a long distance inland, but at one point a spur of the Veragua range penetrates to within 2 miles of the south-eastern side of the laguna, where it has an elevation of 2672 feet. The dense forest growth, whic occupies the mountain-and-hill slope which surrounds nearly the whol of the Chiriquí laguna, extends upwards nearly to the water-divid between the northern and southern oceans, and, secure in its solitud nature revels there in all the fantastic display of an exuberant vegetation. But, crossing the *serrania*, there is a marked change : the forest give way to grass lands along the mountain flanks towards the Pacifi coast, and cultivated fields, pastures, and habitations of man indicat that here nature is in a less riotous mood. The distance from th Atlantic to the Pacific, across the district described, is 50 miles. Th mountain slopes, owing to the ceaseless erosion of the rain-laden trad winds, are sharper on the Caribbean side than on the Pacific inclin which is also much dryer than the former. This is true of the whol isthmus—at least, that part west of the Gulf of San Miguel.

From the laguna de Chiriquí eastward to the river Chagres, th forbidding coast-line (of coral reef, sandy beach, mangrove swamp, an a few precipitous bluffs) has no sheltered anchorage. A heavy sur breaks continually along nearly the entire shore. To the westward o the Chagres river 25 miles, and to the eastward of it as far as Puerto belo, the shore is low and flat, and deadly exhalations from the swamp veil the interior of the country from view.

The so-called Bay of Colon, named in honour of Colombo, wh discovered it in 1502, lies just to the east of the mouth of the Chagre river. It is poorly sheltered, and, being open to the north, is expose to "northers," which frequently blow with such violence that th shipping is forced to run out to sea or seek shelter at Puertobelo This place, historic in the colonial period of South America, and then the seat of the galeon trade between Spain and the West Coast, is pestilential port without ventilation, owing to the high hills which enclose it on the north and south and prevent the winds from sweeping away the malignant miasma which constantly rises from the swamps on the east. A coral reef skirts the southern shore, and the city and the ruins of the castle of San Jerónimo are situated on the beach in the south-east corner. The width of the entrance to the port is 1¼ miles, but it soon narrows to half a mile. The depth of water gradually decreases to 7 fathoms. Puertobelo, as a harbour, is the best between Almirante bay and that of San Blas. In fact, there is no other worth mentioning.

Of San Blas, Commander Selfridge, who surveyed it, says, "It extends in a north-east and south-west direction some 20 miles, and is about 10 miles in extreme breadth. It is formed by the cape of San Blas and the outlying islands of the Mulatas archipelago, and is a most magnificent bay, with deep passages, and perfectly protected from the north winds in the dry season. In the north-west corner is an inner harbour formed by a circle of islands, with a passage leading into it. This harbour is magnificent for all purposes required as the great terminus of an interoceanic canal." General E. W. Serrell says of the Bay of Mandinga, which is at the south-west side of the Gulf of San Blas, "The water is 80 feet deep within 100 feet of the shore, and nowhere less than 60 feet deep all the way into the Atlantic ocean." The width of the isthmus at San Blas, from ocean to ocean, is 37 miles. This is the shortest interoceanic distance on the Western Continent.

From San Blas bay, for a distance of about 80 miles, is the remarkable belt of cays, islands, and reefs known as the Mulatas archipelago. The cays are sandy and mostly in clusters, but little out of water, and thickly wooded. Between them are found many navigable channels. East of the Mulatas, and as far as Port Escocés, many cays also make the coast navigation dangerous and extremely difficult; but further towards the Gulf of Urabá, these obstructions cease to exist.

Between Point Sasardi and Point Escocés is a broad line of cays, sheltering what is known as Caledonia bay, in which are two harbours, the western called Sasardi, and the eastern one known as Caledonia. The former is about three-quarters of a mile in extent, with 4 to 6 fathoms of water; and the latter, the entrance to which is obstructed by dangerous shoals, has from 8 to 9 fathoms at the anchorage. The bold Atlantic frontage of the Serrania del Darien, from the Gulf of Urabá to Puertobelo, is thickly forested, and receives the full force of the north-east trade winds, with a resultant heavy rainfall.

Turning to the Pacific coast, we find the Gulf of San Miguel, or "Darien of the south," on the eastern side of the great shallow Bay of Panamá. At its head is the Bay of San Miguel, which was a great resort for the buccaneers, who reached it from Caledonia bay in ten days by one of the routes which served for communication between the two oceans by the Indian tribes before the discovery of America. The bay is over 6 miles wide at its mouth. It has plenty of water on its eastern side, but is shallow on its western one. As at Panamá, it has a tidal range of 20 feet or more, while Caledonia bay, on the Caribbean side, like Colon, is almost tideless. Darien harbour, at the head of the gulf or estuary of San Miguel, extends in a south-east direction up to the village of Chupigana, where it receives the Tuira and Savana rivers. Its deep water affords anchorage to the largest ships. Mangrove swamps, backed by thickly wooded hills, are almost continuous along its shores.

The island-filled Bay of Panamá, at the head of which is the famous city of the same name, is well known. It commences at Cape Garachina at the southern entrance of the Gulf of San Miguel, makes a majestic sweep concave to the south, and terminates at Cape Malo, which is the south-east cape of the great peninsula of Azuero. The direct distance between the two capes is about 100 miles. The northern part of the bay is shallow, and large ships have their anchorage near the famous island of Taboga, 9 miles south of the city of

Panamá. On this island Pizarro, Almagro, and Luque made their famous contract to discover and conquer the empire of the Ingas. The latter was cheated out of his share of the plunder, and Almagro was garroted in prison at Cuzco by the brother of Pizarro. Sailing-craft find it extremely difficult to get in or out of the Bay of Panamá, but especially out. It is one of the most tedious and difficult bits of navigation in the world. Pizarro was the first to try it, in November, 1525, but, after seventy days, was forced to abandon the effort to leave the bay; and it is still the similar experience of nearly every craft unaided by steam. It is a region of calms, doldrums, vexatious currents, squalls, rains, and tormenting heat.

The city of Panamá is situated on high ground at the foot of Ancon hill, but west of old Panamá, which was destroyed by the buccaneers under Morgan in 1673. To the mouth of the river Bayámo, about 25 miles, and for another equal distance to the south-east, the coast is flooded, and at low water mud flats are exposed for a distance of 3 miles from the shore; but further on, as far as the Gulf of San Miguel, the margin is higher, with occasional small hills. From Panamá southwest to the Bay of Parita, on the western side of the Bay of Panamá, the coast-line is considerably broken, and alternates between high and hilly ground and low flooded areas, the whole shore-line being generally of mud. The entire shore of the Bay of Parita is flooded land, and has a forbidding mud flat extending from 2 to 3 miles out. From this bay to Cape Malo, about 40 miles, the coast is well out of water and backed by the highlands of the peninsula of Azuero.

The southern front of this peninsula varies much in character; west of Cape Malo for about 25 miles, the lowlands soon give place to the escarpments of the cerros, which rise to a considerable altitude further inland, and the remainder of the frontage overlooks the ocean, the mountains, furrowed with gorges, pushing boldly down to the coast. The west side of the peninsula, which partly shelters the Gulf of Montijo, is high ground at times, and at others low with occasional beaches. It has many little bays, with a south-western exposure, which receive the torrents that descend from the mountains.

The Gulf of Montijo, penetrating north about 20 miles, has an opening of some 14 miles. The short river San Pedro flows in at its head, and is navigable for small craft about 17 miles up to the port of Montijo, where there is a little traffic. The gulf has several large and small islands, the principal one, Sabaco, lying off its mouth and completely sheltering it from the south winds.

West and north-west from the Gulf of Montijo, as far as the Bay of David, the coast for the first 20 miles is sharply defined: thence, as far as Espartal island, many hill spurs push down to the sea; the shore then becomes low and cut by numerous small streams. The whole coast, from Montijo's gulf to David bay, has many little bays, most of which are available for vessels of very light draft. The bay last named is filled with cays, reefs, and hilly islands. At its head it receives the river David, which, with its tributaries, drain a vast amphitheatre of mountains which abut upon a broad plain surrounding the little port of David near the river delta. The river has its sources in the *serrania* of Chiriquí, and several of its branches drain the south-eastern slopes of the great volcanoes of Chiriquí and Horqueta, the latter 6600 feet elevation. West of the delta of the David, the coast-line bends in a great curve to the south until it reaches Point Burica at the termination of a peninsula formed by a rugged spur of the Chiriquí mountains.

The Pacific coast-line of the isthmus of Panamá is about one-third greater in extent than that of the Caribbean side. There are many islands along both coasts, but those on the Pacific are more numerous and larger than those on the Atlantic.

A thick, dark, primitive forest covers at least three-fourths of the state, and the vegetation in countless forms fights strenuously and ceaselessly with man for possession of the soil. It is nature's favourite tropical hot-house.

The extreme length of Panamá, from Colombia to Costa Rica, is about 480 miles, and it varies in width from 37 to 110. Its area is between 33,000 and 34,000 square miles, being more than one-half as large again as its last-named neighbour. About five-eighths of it consist of wild, unoccupied lands, and the remainder is but very rudely utilized by its inhabitants. The population was officially estimated, in 1898, at 340,000, representing such a heterogeneous amalgamation of Spanish, negro, and Indian blood, stirred together by the buccaneers of colonial times, that *white* may, in Panamá, be strictly classified as a colour. Until I saw a Panamá "army" of 150 men at drill, I had no idea that the human form could take such shapes and colours—Proteus would have envied them. And yet these men, like all the Colombians, are first-class fighters, and, well officered, are a foe not to be despised by the best troops ever likely to come into collision with them.

Panamá has but slender and insufficient resources to warrant its secession from Colombia. It is doubtful if the step would ever have been taken without external influence—the Panamá Canal company will probably save $40,000,000 by the change.

That Panamá can have an autonomous existence is doubtful. It is now simply a belt of country occupying a privileged geographical position, and must, for many years to come, rank with Honduras, unless the expenses of its administration be admitted as a first charge upon the net revenues of the projected canal, should there be any.*

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* For an estimate of these revenues, and for details as to the projected Panamá Canal, see "Interoceanic Communication on the Western Continent," by G. E. Church, the *Geographical Journal*, March, 1902.

NATIONAL ANTARCTIC EXPEDITION.

THE following letter has been forwarded to Captain Scott through the Admiralty:—

1, Savile Row, W., October 9, 1903.

DEAR CAPTAIN SCOTT,

1. *Receipt of Letters.*—We, the President and Council of the Royal Geographical Society, have received your letters dated January 9, 1902, written off Cape Adare; January 22, 1902, off Cape Crozier; February 22, 1903, describing the position of the *Discovery* in winter quarters; and February 23, 1903, being your summary of proceedings during the winter and travelling season until the arrival of the *Morning*, with its enclosures containing short accounts of some of the sledge journeys; also your letter to the secretary of the expedition dated February 26, with five enclosures. We have endeavoured to give effect to your wishes and requests conveyed to us in your letters and their enclosures to the extent of our power and abilities.

2. *General Approval.*—We are impressed with the value of the work accomplished by your expedition, with the skill and sound judgment evinced in your conduct of the exploring work and in all your arrangements, and by the admirable way in which you have been supported by the officers and men under your command.

3. *Voyage of* 1902.—The exploratory voyage of the *Discovery* within the antarctic circle during the navigable season of 1902 secured all the objects for which we hoped and which are alluded to in your instructions. To a careful examination of the ice-barrier, including hydrographic and other scientific observations, you have added a balloon ascent of considerable interest, and the discovery of a continental land which you have appropriately named after His Majesty the King. It was fortunate that you were able to swing the ship successfully off Cape Crozier, to ascertain the disturbing effects of the iron on the instruments mounted in the magnetic observatory.

4. *Selection of Winter Quarters.*—Your selection of safe winter quarters under Mount Erebus, in so very high a latitude, has been fortunate both as regards the scientific observations and collections, and as a position whence important discoveries have been made. Your description, illustrated by the accompanying tracing, has given us a very clear idea of the position of the *Discovery* in her winter quarters.

5. *Autumn Travelling.*—Autumn travelling has always been the most severe kind of polar work, and the experiences of your officers and men were quite exceptional with regard to the perils and hardships they so manfully encountered. As you have observed, these experiences gained in the autumn were invaluable in the organization of the spring travelling. The men behaved admirably, but their knowledge was dearly bought by the loss of their comrade, poor George Vince, in the performance of an arduous duty. He had no near relations but his cousin, who has been communicated with. We hope a monument has been erected to his memory. We deeply regret that this sad accident should have cast a gloom on an expedition which, in all other respects, has been so prosperous.

6. *Work in the Winter.*—The steadfast and resolute way in which your staff conducted the scientific work during the winter under your superintendence and with your encouragement, has our warmest approval. Great praise is due to Lieut. Royds for his meteorological labours, to Mr. Bernacchi for the magnetic records obtained with the Eschenhagen instruments, and to Mr. Hodgson for his

indefatigable biological work, entailing frequent exposure for lengthened periods. We notice, also, the exceedingly valuable collection made by Dr. Wilson, and the botanical and geological researches of Dr. Koettlitz and Mr. Ferrar. We are also much pleased to know that the scientific staff always received all possible assistance, most zealously given, from their comrades, both officers and men.

7. *Winter Arrangements.*—You and your gallant companions have now passed through the rigours of two Antarctic winters. We realize the great trial to mind and body which such periods of hardship and exposure entail, and the necessity for healthy mental as well as bodily support in order to enable men to pass through it while preserving their health and spirits. Your care and that of your medical and executive officers has secured the great end as regards the first winter by attention to diet, ventilation, and exercise, and by those entertainments and intellectual amusements which drive away despondency and make the time pass pleasantly.

8. "*South Polar Times.*"—The *South Polar Times* does great credit to its editor, Mr. Shackleton, for it contains several really valuable and interesting articles, besides excellent humorous contributions. It is very satisfactory to find that the men joined with the officers in supporting the first Antarctic periodical, and that Mr. Dailey, Kennar, Quartly, and Wild were among the contributors. We trust that Mr. Shackleton, with the assistance of Dr. Keltie, will be successful in making arrangements for its publication, with the really beautiful illustrations by Dr. Wilson.

9. *Scurvy.*—The appearance of symptoms of scurvy in the spring must have been a source of great anxiety, but the prompt and efficient measures adopted by you with the advice of your medical officers seem to have been quite efficacious. Your belief that there will not be any recurrence of those symptoms will, we also believe and earnestly trust, have been borne out by the result.

Supply of Bad Provisions.—We do not propose to take any steps with regard to the supply of bad provisions until your return; but evidence has been taken from Mr. Spadaccini, and all the papers have been put together ready for any action in the matter that may be deemed advisable.

10. *Spring Travelling.*—We can only write in terms of the highest praise and admiration of the achievements of the expedition during the spring travelling, whether we consider the difficulties faced and overcome or the value of the discoveries. Your own memorable journey with your two companions, Shackleton and Wilson, when all the special and peculiar obstacles are considered, takes its place in the first rank of polar achievements. We await your full narrative with great interest, and we anticipate that the careful drawings of such an accomplished artist as Dr. Wilson will give additional value and interest to your results. The inland journey of Mr. Armitage, accompanied by Mr. Skelton, is unique of its kind, as it combines the hardships of polar travelling with the methods and appliances of Alpine climbing. The former experience of Mr. Armitage proved useful, and both officers merit high commendation for their remarkable journey, the scientific results of which cannot fail to be valuable. The discovery of the insularity of Mounts Erebus and Terror, and of the smaller volcanic islands, is due to the labours of Lieuts. Royds and Skelton, and to the various journeys of Dr. Koettlitz with other members of the scientific staff. Lieut. Barne's severe experience during the autumn fitted him to command the two important journeys in the spring, in the last of which he reached a latitude only second to your own. His care of the men forming his sledge cruise deserves the commendation you have given it.

11. *Conduct of Men.*—We particularly desire to express our approval of the

zeal and fine conduct of the men under your command. They have maintained the noble tradition of the navy whenever it has been employed on voyages of discovery. In all polar expeditions, since the return of that under Sir George Nares, travelling has been effected by means of dogs. Your gallant fellows have achieved their excellent results mainly without the aid of dogs; by sheer hard work, by a strong sense of duty, and by that indomitable pluck which has ever characterized the British sailor. Nor would we forget the sister service, so well represented by Lance-Corporal Blisset and by that resourceful young soldier, Gilbert Scott. We desire that you will tell the men how highly we appreciate their loyalty to you and to their officers, and their splendid zeal and endurance to which the success of the expedition is so largely due.

12. *Details yet to come.*—We quite understand that time only allowed you to give us the barest outline of the results of the expedition in your reports and letters now under reply, and we look forward with great interest to the receipt of your complete results and conclusions after your return.

13. *Recommendations to the Admiralty.*—On receipt of your letter with recommendations respecting the men under your command, we sent a copy to the Lords Commissioners of the Admiralty, earnestly requesting that their service prospects may in no manner suffer from their prolonged absence. We received sympathetic replies, of which copies are enclosed, together with our forwarding letter. You will observe that all your recommendations have been complied with.

14. *Mr. Armitage and the P. & O. Company.*—The directors of the Peninsular and Oriental Steam Navigation Company were addressed with reference to the valuable services and prolonged absence of Lieut. Armitage, and a cordial reply was received.

15. *Arrangements for the Second Relief Voyage.* — On the arrival of the *Morning* at Lyttelton on March 26, 1903, orders were at once given to Captain Colbeck to attend to her repairs, to supply defects, and make other necessary arrangements. The stores contained in the list you transmitted were ordered, and their supply was placed under the superintendence of Mr. Shackleton. With regard to your indent for gun cotton and blasting gear, an application was made to the Admiralty for these stores to be supplied from Sydney. This has been done, and they will be taken to you by Captain Colbeck. The two large ice-saws were ordered at Dundee.

16. *Financial Position.*—The balance of the *Discovery* fund is only sufficient to pay the salaries and wages until October, 1904. It is necessary, therefore, that you should exercise all possible economy with regard to further expenditure.

Dr. Wilson and Mr. Hodgson: Increase of Salary.—You have, however, considerably reduced the wages bill, and we have great pleasure in complying with your request that the salaries of Dr. Wilson and Mr. Hodgson be increased by £50 each from the date of your letter.

17. *Application to Government.*—We have been obliged to apply to the Government for assistance for the present Relief Expedition, and for the needs of the *Discovery*. On June 20, the Secretary to the Treasury announced that the Government would undertake the Relief Expedition on condition that the ownership of the *Morning* was transferred to the Admiralty, her value being required as a set-off to the expenses of the Government. The vessel has been handed over to the Admiralty, who have undertaken all expenses and responsibility in connection with the present Relief Expedition.

18. *Relief Ships.*—Captain Colbeck has been retained in command, receiving his instructions from the Admiralty, and another vessel, we understand, has been added, the whaler *Terra Nova*. Both, we were informed, will be under Captain

Colbeck's orders on the outward voyage. We trust that the two ships will arrive in time to afford you active assistance in the work of breaking out of the ice. It is understood that, on the arrival of the relief ships, you will receive instructions respecting them from the Admiralty.

19. *Breaking out of the Ice.*—We have read your descriptions of the position of the *Discovery*, and your views respecting the ultimate prospect of the ship being freed. You are acquainted with all the former experiences relating to the extrication of ships from all quarters in the Arctic regions. You are possessed of the knowledge of the use of explosives; and you are supported by a chosen band of officers and men. If human forethought, skill, energy, and perseverance can free the *Discovery* from her icy prison, we are convinced that this great object will be achieved. If not, she will remain a monument of a memorable expedition. She will, we hope, not be derelict, but that you may be able to leave her securely moored in harbour.

20. *Return to Lyttelton.*—If the *Discovery* is released, she is to proceed to Lyttelton for the comparison of magnetic instruments and for repairs. If you have to return in the relief ship, you are to proceed to the same port.

21. *Return to Lyttelton. Further Arrangements.*—Be assured that, under any circumstances, on your return to Lyttelton proper arrangements will be made for furnishing you with the necessary credit to enable you to refit your ship at Lyttelton and bring her home. You will find a letter from us awaiting your arrival at Lyttelton, containing further instructions and an announcement of the arrangements we have been able to make. You are at once to telegraph your needs and wishes, and they will be supplied and complied with to the extent of our abilities. Details will be left entirely to your discretion.

22. *Return Home.*—We sincerely trust that you and your gallant companions will have passed through the second winter without injury to health, and that within another year your country will cordially welcome your return to home and friends with the fruitful results of your labours.

(Signed) CLEMENTS R. MARKHAM,
President R.G.S.

REVIEWS.

AFRICA.

THE TAWAREK.

'A Search for the Masked Tawareks.' By W. J. Harding King.
London: Smith, Elder. 1903.

To the *Journal* for November, 1902, Mr. Harding King communicated a short account of an excursion which he made in the spring of 1900 to the southern parts of the French Sahara, with the twofold purpose of studying the physical features of that region, and of interviewing a band of Hoggar (Ahaggar) Tuaregs, said to have just then pitched their tents in the neighbourhood of Tugurt. Permanent form is now given to that communication in the book under notice, which, however, contains a considerable amount of fresh matter, either collected at first hand by the author, or drawn from such recognized French authorities as MM. Duveyrier, Hanoteau, Mercier, and Bissnel. The author has a good eye for natural scenery, and is a shrewd observer of human character, and the result is a very readable and instructive volume, which is, moreover, enriched by a large number of photographic views of the land and its people taken on the spot.

For the geographer the chief interest lies in the section between Shegga and Tugurt, comprising the valley of the Wad Rirh—that is, the lower course of the Wad Igharghar, which in late Tertiary times carried a great volume of water from the Tasili and Ahaggar uplands for hundreds of miles across the now waterless Sahara northwards to the Aures escarpments, and thence through the region of the Shotts eastwards to the Mediterranean. These shallow surface waters are all that are still visible of that mighty Saharan artery. But after the French occupation, modern science was not long in piercing below the surface to the underground reservoirs along the course of the Wad Rirh valley, and tapping them for irrigation purposes. Our author gives a graphic account of the rude methods of reaching the water-bearing strata which had been in operation from remote times, and are now replaced by properly constructed artesian wells. The date-palm area has thus been greatly extended, and the French company that have taken this work in hand "have not only supplemented the supply of water in the existing oases, but have created several new oases of their own." Indeed, the success that has attended their efforts has produced a false impression, and because artesian wells have been profitably sunk along the bed of an underground waterway, it has been concluded that a great part of the Sahara might again be transformed to "a region flowing with milk and honey," as in Pliocene times. Some parts of the section traversed by the expedition are, however, still far removed from the popular idea of a boundless sandy waste, and we read that "the Sahara in the spring is a delightful country to travel in. The air, though warm, is usually wonderfully soft and invigorating. Mosquitoes are unheard of, and flies, the plague of most warm countries, are unknown beyond the oases."

The Ahaggars, a party of whom were interviewed and photographed by the author, form one of the main sections of the Saharan Hamites, who are commonly called *Tuáreg*, or *Tawárek* (plural of the Arabic *Tarki*, of doubtful meaning), but always call themselves *Imoshagh*, or *Imohagh* (plural of *Amoshagh*, or *Amohagh*, "free," "noble"). The Ahaggar section, whose domain extends from about 30° N. to the Tropic of Cancer between 0° to 7° E. over the rugged Tademagh, Tidikelt, and Muydir plateaux, forms a powerful confederacy of fierce and warlike tribes, who have hitherto presented the chief obstacle to the French advance across the Sahara to the Sudan. All are *Ahl el-Litham*, "veiled people," and comprise two social classes—the nobles, whose business is raiding and fighting, and who wear a black litham; and the Imghad, a servile class, who do all the work and wear a white litham. Hence the figure arrayed in black, which adorns the cover of this volume, is that of a noble, and Mr. Harding King writes me that it is not a fanciful design, but a real portrait from a photograph, though not from one taken by himself.

In an appendix "On the Origin of the Tawarek Alphabet," an attempt is made to trace this peculiar script to a Hellenic source; but the argument is not convincing, and breaks down at one or two material points. Still less satisfactory is the erratic spelling of geographical terms, which, like the Greek of "Ausonia," *sine lege vagantur*. There is little agreement between the text and the map, which present such variants as Tugurt and Tougourt; Kef el-Dohor, Kef ed-Dour, and Kef el-Dour; Milrir, Melrirh, and Melchir—this last quite an impossible (English) transliteration of the Arab form. In a future edition, this chaotic state of things should be reduced to order; the index also would admit of much enlargement, and a table of contents should be supplied.

A. H. KEANE.

SIERRA LEONE.

'The Advance of our West African Empire.' By C. Braithwaite Wallis. London: Unwin. 1903.

The comprehensive character of the title of this work is not quite justified by its actual scope, which is virtually limited to the one protectorate of Sierra Leone. The value of the book is not, perhaps, lessened by this limitation, but those who expect to find in it a general history of the recent development of British West Africa should be warned that this will not be the case. Captain Wallis went out to Sierra Leone under the orders of the Colonial Office early in 1898, and took an active part in the events of that troublous year, commanding one of the military columns engaged in the suppression of the native revolt, which, with its unspeakable atrocities, proved such a critical episode in the history of the colony. Captain Wallis sketches both the events which led up to this deplorable rising and the general course of the operations by which it was finally put down; not confining himself to his own share of the work, but describing, if at less length, the broad features of the campaign as a whole. The two main centres of the revolt were the Timini country in the north, where its instigator was the chief Bai Bureh, and the Mendi country in the south, where matters assumed an even more serious aspect; but of the whole area of the protectorate only the Koinadugu district in the north-east escaped contamination by the general disaffection. Captain Wallis brings out clearly both the formidable character of the rising—the most serious, perhaps, that has ever been faced by the British in West Africa—and the extraordinary difficulty encountered by those responsible for its suppression. Of the extraordinary secrecy, coupled with deadly determination, with which the Mendi revolt was organized, he gives a striking picture, and its outcome was a sequence of massacres and outrages, "the most terrible in the annals of our colonial history."

To the future historian of Sierra Leone the details supplied will be invaluable; but of wider interest, perhaps, is the light thrown on the general principles of British administration in the protectorate, which may serve in some degree as a sample of the policy adopted in our general dealings with the African race. As regards the motive of the rising, Captain Wallis shows clearly that it was not really a "tax-war," but a "slave-war," undertaken in the hopes of re-introducing practices prohibited under British rule, and that the imposition of the hut-tax merely supplied the excuse for an inevitable conflict between civilization and barbarism. He holds enlightened views as to the rules by which our conduct should be regulated in our endeavour to introduce civilization into the dark places of West Africa, showing that it is by making use of the native himself as an ally in the work that progress can alone be guaranteed. At the same time he realizes—and the revelations of fiendish cruelty of which the native in his natural state is capable put the fact beyond question—that there is much in the former *régime* so distinctly evil that it admits only of absolute suppression. Some good results in this direction have already been attained since the war, and the author was struck, on his return in 1902, with the immense strides already made. From the point of view of economic development, he is also disposed to take a sanguine view, insisting on the great natural resources of the country, but showing also the need of an energetic and enlightened policy. In this direction, too, it is only through the natives themselves that results of real value will be reached.

Southern Angola.

'Kolonial-Wirtschaftliches Komitee. Kunene-Sambesi-Expedition. H. Baum. 1903.' Herausgegeben von Prof. Dr. O. Warburg. Berlin: Kolonial-Wirts. Komitee and Mittler & Sohn. 1903.

As has already been mentioned in the *Journal*, an important expedition was sent out in 1899 by the German Kolonial-Wirtschaftliches Komitee, which is doing so much to bring about an improved knowledge of the colonial possessions of that country, with a view to the thorough examination of the economic resources (principally botanical) of South Angola. The expedition was most fruitful in results, which are here made public under the editorship of the well-known botanist, Dr. Warburg. It is probable that no one expedition has brought back from West Africa such a rich harvest of botanical *data* since the time of Welwitsch, whose labours, it will be remembered, had to do with this very region. They throw light, not only on the flora of Southern Angola, as composed of such and such individual species, but on the distribution and life-conditions of the plants as influenced by their physical surroundings. In all, no fewer than 350 pages of the work are taken up by the botanical results of the expedition.

The country traversed is perhaps one of the least-known parts of Africa from a purely geographical point of view, and as the routes diverged largely from those of the few previous travellers—Pinto, Capello and Ivens, and, in the more eastern parts, members of Major Gibbons's last expedition—a certain amount of new material has been gained in this direction also, even though the absence from the party of a trained surveyor prevented the opportunities presented for mapping the country from being utilized as they might. The map which accompanies the volume, which at first sight appears valuable from the considerable amount of detail inserted, is disappointing on closer inspection, from the evident untrustworthiness of the geographical co-ordinates, no attempt having been made to utilize the positions fixed by other travellers. This makes it almost impossible to correlate the *data* with those of previous maps, many of the features being laid a full degree at variance with their positions on Mr. Ravenstein's map of the results of Major Gibbons's expedition, given in the *Journal* for February, 1901. It is only in regard to the topographical details of previously unvisited districts that the map is likely to prove at all serviceable, and even these must be accepted with caution.

Some geographical information of value is, however, to be found in Herr Baum's narrative of the journey, which occupies the first 153 pages. The route led from Mossamedes by the valley of the Kakulovar to the Kunene, and up an eastern tributary of the latter to the upper Kubango. This was followed down through over 3° of latitude, after which the route led north-east to the Kwito, and thence east to the upper Kwando, the return being made by a more northerly route. Notes are given throughout on the nature of the surface features, especially the vegetation, the mode of cultivation by the natives, and so forth. Particular attention was given to the rubber-yielding plants, among which *Carpodinus chylorrhiza*, the roots of which are dug up to obtain the product, is the preponderating species. Its habitat is formed by the open sandy tracts surrounded by forest which occur between the watercourses, but are themselves waterless. The method of preparation of the caoutchouc is fully described and illustrated by photographs. The most characteristic tree of Southern Angola is the "Houtbosch" (*Berlinia Baumii*), the bast fibres of which are largely used for cordage, etc., while the bark serves to make boats.

Herr Baum considers that the fertile districts near the coast are well adapted for cotton-cultivation, though at present only the sugar-cane is grown. Towards the west the soil of the interior plateau is generally loam or clay, capable of growing European cereals, vegetables, and fruits. East of the Kubango and Kwebe the country is characterized by streams with swampy banks and sandy hills between them, the rainfall permitting the cultivation of crops by the natives. This is also the principal rubber district. The timber supply is generally abundant, but the principal value of Southern Angola consists in its eminent adaptability for cattle-rearing.

MATHEMATICAL AND PHYSICAL GEOGRAPHY.

MEDIÆVAL CARTOGRAPHY.

'Alcuni Cimelli della Cartografia Medievale esistonti a Verona.' By Giuseppe Crivellari. Firenze: Bernardo Seeber. 1903. (48 pp.)

This excellent monograph is principally devoted to an examination of the planisphere of Giovanni Leardo, executed in 1442, and now in the Communal Library at Verona (pp. 5–31); shorter studies are added, (α) on an unsigned portolano of the fifteenth century in the Capitular Library of the same city; (β) on the 1592 portolan of Jaume (or Jayme) Ollives of Majorca; and (γ) on the 1592 Atlas of Giacomo Scotto; also in the Verona Capitular Library. An excellent coloured reproduction of the Leardo planisphere is supplied at the end.

Leardo's planispheres of 1448 and 1452 were already well known to students of the later mediæval cartography, but the work of 1442 has not yet received general notice. A long inscription at the foot of the map tells us, in conclusion, *Johannes Leardus me fecit* 1442, and gives the following information: *Per—Il mapamōdo-sora-schrito-sepuo vedere chome latera-e le·ixolle-stano-nel mare el primo-circhollo-sie-dei*-12-*mesi de lano el segondo-sie-dei*-12-*segn çellesti·el terzo-sie della-rapo·della pasqua-chome nel*-1441-*adi*-16-*aprille-chonpie-nel chonpie-nel*-1535 · *adi* - 28 - *marzo-che-so per ani*-46-*quādo-se troua-nelle-chaxelleletere-M-quel ano la pasqua-vien-de marzo quādo se troua-letera-A-quel ano la ue daprille-quādo-se troua-B-quel ano chore Bixestro*. The design is absolutely circular in form, and measures 278 mm. in diameter; the mappemonde proper is encircled (1) by the months, (2) by the signs of the Zodiac, (3) by the calendar described in the foregoing inscription. In the left-hand lower corner is the legend *Mapa Mondi*; in the right-hand corner, over against this, are the words *Figura Mondi*. Jerusalem, as in the Leardo of 1452, is made the centre of the Earth; on the other hand, by the side of this concession to unscientific ideas, the portolano type of coast draughtsmanship appears in certain of the Mediterranean lands and in the Black sea, on the ocean-shores of Spain and Portugal, and in the British isles. The North African shore, at least from Ceutra as far as Tunis, is not badly drawn, and some of the Mediterranean islands are fairly well conceived; of distinct merit, also, is the draughtsman's delineation of the Crimean peninsula and the Sea of Azov, so thoroughly known to Italian traders of the later middle ages, not only from their Krim settlements at Kaffa and elsewhere, but also from their great factory at the mouth of the Don. This factory—Tana—appears upon the Leardo planisphere, as do the mountains of Gog and Magog in the far north-east of Asia (*montagna de og/ e magog doue so sera/ de moltitudina de tartari*). So in the furthest east is depicted a huge castle, labelled *Paradixo teresto*, slightly to the north of the pepper-and-spice archipelago (y^{e} *doue nasse piper e altre/ . . . spezie*), separated by a mountain wall from the three Indias (*India de sora*, *India de mezo*, *India de soto*), which follow in a line from east to west without a sign of the Indian peninsula. Fronting these three Indias, in the eastward projection of an Africa which Edrisi might have drawn, we meet with

Imperio de la/ Balsera—in other words, Basra, Balsora, or Bassora—transferred to the wrong continent from the Shatt-al-arab, exactly as in the Andrea Bianco of 1436. To the west of this, enclosed by the upper waters of the Nile, is the realm of Prester John (*Imperio del pr/esto iani*, further defined as *paexe-del-presto/ iani-questi duo fiu/mi-s'e-insuo li/bertade-de-tegn/ villi-e de lasa/rli-i qualli cun/ duxe aqua/ al chaiero e/in alesandria*). No indications are given us of the discoveries of the Portuguese in West Africa, which had by this time advanced well beyond Cape Verde, except for *Buider* (Bojador, which is really pre-Portuguese), *f. deuoro* (f. dell'-oro, associated with the Catalan voyage of 1346 quite as much as with the Portuguese voyages of 1435, etc.), *gruena* (Guinea). Towards the extreme south, Africa is represented as contracting to a peninsula, and then expanding into a southern continent, where no one could dwell for heat and serpents (*Dixerto dexabitado p. chaldo e p. serpenti*). This unhappy land is coloured scarlet, like the Red sea (*Mar rosso*), presumably to signify the burning heat which one must suffer there. Answering to this, the extreme arctic zone is entitled *dixerto dexabitado per fredo.* Following the common misconception of inferior mediæval maps (long since corrected by the Catalan atlas of 1375), the celestial empire, China, or Cathay (*tenplon chatai*), is thrust up to the far north-east of Asia, and placed on the upper waters of a river which communicates with the Caspian, or Sea of Baku (*Mar do bachu*). The Scandinavian peninsula is also of the thoroughly dark-age pattern; the Danish land projection does not appear at all; and the Baltic has the name of Sea of the Germans (*Mar dalemani*). It is therefore apparent that, apart from the Mediterranean basin, the Spanish lands, and Great Britain (*Ingdltera, Schozia*), this planisphere of 1442 shows very little even of that degree of enlightenment which one might expect in the middle of the fifteenth century, almost seventy years after the Catalan atlas had been draughted, and more than ninety since the execution of the Laurentian portolano of 1351. For obscurantism, indeed, the present work is in places a parallel to (though never as debased as) the Borgian map of 1450. Perhaps its most notable feature is its clear indication of Prester John in East Africa—one of the earliest of such indications)—but without any apparent identification of that potentate with the Negus of Abyssinia. Up to the 1436 mappe-monde of Andrea Bianco, it would be difficult to find any work of European cartographers which placed the Priest-King anywhere but in Asia; and even in Leardo (as in Bianco) the *imperium presto iani* lies in a kind of infinitely extended Somaliland, and fronts India across a sea no broader than the Mediterranean. On the other hand, it must be noticed that the Prester's Realm is not identified with any extension of "India," nor with *Etiopia*, which lies a considerable way to the west of the *paexe del presto.*

C. RAYMOND BEAZLEY.

SUPAN'S PHYSIOGRAPHY.

'Grundzüge der Erdkunde.' Von Prof. Dr. Alexander Supan. Dritte, umgearbeitete und verbessert Auflage. Mit 230 Abbildungen in Text und Zwanzig Karten in Farbenbruck. Leipzig: Verlag von Veit & Comp. 1903. Pp. x., 852.

This well-known work is a true physiography, and is divided into six parts: I. The Earth as a Body and the Main Outline of its Surface Conditions; II. The Atmosphere; III. The Ocean; IV. The Dynamics of the Land; V. The Morphology of the Land; VI. The Plant Covering and the Distribution of Animals. In preparing the third edition, Dr. Supan has added some 140 pages to the text, which has been carefully revised throughout. The book is one of the best, if not the best, summary we possess of the present state of our knowledge of phenomena on the surface of the Earth, and its usefulness is much enhanced by the brief references to literature at the end of each chapter. Dr. Supan, however, does more than merely reproduce the work of others; the treatment of the subject every here and there is distinctly original, while everywhere it is clear and authoritative. The chapters in the section on the Morphology of the Land are among the most valuable, and contain an elaborate and interesting classification and description of forms, which is, perhaps, the least unsatisfactory of the many which have been devised to include all the infinite variety of shapes into which the surface of the Earth has been moulded and carved. The book is one of the indispensable works in a geographer's library.

HISTORICAL GEOGRAPHY.

Ancient Map of Asia Minor.

'Asia Minor.' Ed. by J. G. C. Anderson, M.A. Murray's Handy Classical Maps. Ed. by G. B. Grundy, M.A. London: John Murray. 1903.

Mr. Anderson's repeated visits to various parts of Asia Minor, and his long study of its ancient geography, have given him singular qualifications for revising its ancient map. A great deal of research has gone to the placing of the city names, and where Mr. Anderson is not a first-hand authority (as he is in the north and north-central parts), his identifications, etc., present the latest work of Prof. Ramsay, M. Radet, M. Cumont, and many others. The provincial boundaries, marked boldly in red, are drawn somewhat conventionally, as is inevitable in the absence of exact knowledge of the delimitation lines. For the relief detail Messrs. Bartholomew are responsible, and it is as correct as is to be expected in the case of a country where very few heights have been fixed by any better process than aneroid readings. On the whole, this is the best of Mr. Murray's series that we have seen, and the best existing map of ancient Asia Minor on a handy scale.

D. G. H.

Ancient Greek Geography.

'Geschichte der Wissenschaftlichen Erdkunde der Griechen.' By Hugo Berger. Second Edition, improved and enlarged. Pp. v., 662. Leipzig: Veit & Co. 1903. (A few figures in the text.)

A revised reissue of the best history of ancient geography which exists. The learned author has added a little to the total bulk—not more than some twenty-five pages—but this addition does not represent all that is new; for the introductory chapters, which were required when the work originally appeared in four fascicules have been eliminated in the single volume. A new preface sets forth the main problems which ancient geographers tried to solve, and the index has been greatly enlarged. No student of ancient geography can afford to dispense with this volume.

Arab Descriptions of Egypt.

'Beschreibung Ägyptens im Mittelalter, aus den geog. Werken der Araber.' By Else Reitemeyer. Pp. 238. Leipzig: Seele & Co. 1903.

A book of a popular kind on a subject for which it is hard to believe there is a popular demand. The best known of the Arab writers on Egypt alone are dealt with, and there is no attempt to treat even these exhaustively. For instance, only a very small part of what they say on the provincial towns is repeated, and there is little or no comment on the correctness of their information. The book is, in fact, a sort of delectus, which, to judge from the disproportionate space assigned to the Arab reports of Egyptian antiquities, seems to be intended for the general cultivated public rather than for scholars. It is a grave drawback to the usefulness of the book that it is issued without index, page-headings, or any but the scantiest table of contents.

THE MONTHLY RECORD.

EUROPE.

The Building of the Grampians.—Mr. Peter Macnair, of the Glasgow Museums, has undertaken a rediscussion of the problem of the Grampians, which he defines as the high grounds of Aberdeenshire, Kincardineshire, Forfarshire, Perthshire, and Argyllshire. The complex structure of this area has been variously interpreted, and Mr. Macnair summarizes the salient points in the chief contributions towards its elucidation. His own point of view is that the Grampians are to be regarded as of very complex structure, and, following Lapworth, he considers them to be the basal wreck of such a mountain chain as the Alps, where the complicated fan-shaped structures and complementary troughs have been planed down by denudation so as to simulate simple anticlines and synclines. The chief axes of these fan-shaped structures run along Loch Awe in the north-west, and on the margin of the Highlands from Inch Malcolm west of Bute to Helensburgh; while the intervening structural trough forms the Cowal axis, and extends from near the mouth of Loch Fyne, by the north of Loch Riden to Ben Vorlich. This latter structural trough very nearly coincides with the axis of maximum foliation. The oldest rocks for the author are found along the south-western highland margin, and a succession of younger and younger rocks is found in passing towards the north-west. The movements which folded the rocks are supposed to have acted from it west to south-east, for where bedding can be traced the overfolding is generally to the south-east.—*Proc. R. Phil. Soc. Glasgow*, **xxxiv.** 1902-1903, pp. 147-224, with map and sections.

Electric Railway up Vesuvius.—Messrs. T. Cook and Son have just completed a new electric railway, which starts from Pugliano, near the base of Vesuvius, and connects with the old funicular railway, which for the last twenty-three years has climbed the actual cone of the volcano to the crater. The work has been carried out under the direction of Herr Strub, of Zürich, well known as a specialist in mountain railway engineering.

Bridging of the Volga.—It is stated that it has been definitely decided to construct either a bridge or a tunnel connecting the two banks of the Volga near Kazan. It is estimated that the bridge would cost 3½ million roubles, and the tunnel nearly six million. The Volga is also to be bridged near Saratov.

ASIA.

Captain Rawling's Surveys in Western Tibet.—Writing from Phobrang, in Ladak, on October 4, Captain C. G. Rawling, whose recent expedition into western Tibet was assisted by a grant from our Society, announced the successful conclusion of the undertaking, a total area of 38,000 square miles having been accurately surveyed with the assistance of Babu Ram Singh, a sub-surveyor lent by the Surveyor-General of India. Captain Rawling left Leh, accompanied by Lieut. A. J. G. Hargreaves, in May last, and crossed the frontier by the Lanak La, striking thence due east, in order to extend the survey beyond the part reached by Captain Deasy. After reaching the Arport (Horpo) Tso lake, some difficulties were encountered owing to the desertion of a party of men who were to bring in a supply of grain by yak, and to the loss of eighteen out of twenty-five ponies during a blizzard of eight days. The loss of the grain was, however, made up by the use of a supply buried by Captain Deasy in 1898. The country to the north-east was a barren desert of mountains and salt lakes, with practically no animal life; but to the south-east the level dropped gradually from 16,500 to 15,000 feet, the surface becoming grassy, and abounding in antelope (*Panthulops Hodgsonii*) and wild yak. This country was frequented by nomad Tibetans, who proved very friendly; but on approaching the gold-diggings of Munok Tok, the further advance towards Rudok was prohibited by an official from Tok Jalung, who, however, showed himself otherwise well disposed. The return to Kashmir was therefore made by a route leading north-west, through a district abounding in gazelle and burrel, to Noh. The most easterly point reached was, according to a sketch-map sent to us by Captain Rawling, in about 83° 45′ E., all the routes being included between the parallels of 33° and 35° 30′. Numerous lakes—some salt, some fresh—were discovered, the name Lake Markham being bestowed on the largest, a partly fresh body of water 70 square miles in extent. Many small streams enter the lakes, but there are no large rivers. Other lakes that formerly existed have now disappeared, leaving dry beds of salt and soda, while all show a diminution in size, owing, Captain Rawling thinks, to a falling off in the amount of snowfall. We hope to receive a fuller account of the journey before long, for publication in the *Journal*. Meanwhile, the extensive cartographical material is being worked up by the Survey of India Department.

The British Expedition into Tibet.—The mission lately entrusted to Colonel F. E. Younghusband, of proceeding to Tibet for the purpose of negotiating with the Tibetan authorities, and, if possible, coming to an arrangement for the encouragement of trade relations with that country, has assumed the shape of a military expedition, by reason of the unfriendly, not to say threatening, attitude assumed by the Tibetans. Colonel Younghusband, who, with Mr. White and other political officers, had reached Kamba Jong in Tibetan territory, has been summoned to Simla for the purpose of conferring with the authorities regarding the composition and plans of the expedition. The command of the forces employed has been given to Colonel Macdonald, and the route chosen is that by the Chumbi valley—the wedge of Tibetan territory which runs down between Sikkim and Bhutan, which, from its favourable climatic conditions, has been a favourite summer resort of the rajas of Sikkim. It is approached from British territory by the Jelep La (14,390 feet), on the route to which is the British post of Gnatong (more properly Natang). Those who wish for the best information on the physical geography and present state of affairs in this borderland between India and Tibet cannot do better than consult Mr. Freshfield's just-published book, 'Round Kangchenjunga,' which has appeared at a most opportune moment. At pp. 59 *et seq.*, Mr. Freshfield gives a succinct sketch of our relations with Sikkim and Tibet from 1817 onwards, the principal events being the interference (in that year) of the East India Company to check the encroachments of Nepal; the cession of the Darjiling district in 1835; the arrest of Dr. Campbell and Sir Joseph Hooker in 1848 by the Sikkim prime minister, and other insults on the part of that state, which ended in the war of 1861, by which our suzerainty was effectively established; the abortive Macaulay mission in 1886; and, lastly, the war of 1888, by which, though the Tibetan forces were thoroughly routed and dispersed, no real advance towards more satisfactory relations between India and Tibet was made. It is to be hoped that present events will once for all settle the long-pending controversy, and establish on a firm footing the wished-for facilities for the extension of British trade with Tibet. Another book which may be read with advantage is Colonel Waddell's 'Among the Himalayas.' It is hardly necessary to add that the best information respecting earlier European relations with Tibet, from the time of the Jesuit and Capuchin missionaries who laboured at Lhasa during the early part of the eighteenth century, to that of the British embassies due to the far-seeing policy of Warren Hastings, and of the one

British visitor to Lhasa—Thomas Manning—is to be found in Sir Clements Markham's well-known book, published in 1876.

American Expedition to Russian Turkestan.—Prof. Raphael Pumpelly, of Newport, R.I., has recently returned from a summer's journey in Turkestan, where he made a reconnaissance, under the auspices of the Carnegie Institution, of the ancient human occupation of the region in relation to its physical geography. The other members of the expedition were Prof. W. M. Davis, of Harvard, Mr. Ellsworth Huntington, Carnegie research assistant, and Mr. R. W. Pumpelly, with Mr. S. de Brovtzine, of St. Petersburg, as interpreter. Mr. Richard Norton, director of the American School of Classical Studies in Rome, was an independent member of the party. From Baku, the great petroleum port on the west coast of the Caspian, the travellers crossed by steamer to Krasnovodsk, May 23, whence the Central Asiatic railway carried them, with many stops and side excursions on the way, to the end of the main line at Tashkent, and to the end of a branch line at Andizhan, June 26. Prof. Pumpelly, with Messrs. Norton and R. W. Pumpelly, then made an excursion south-eastward across the Alai range and valley to Lake Karakul on the northern Pamir, returning *viâ* Andizhan, Baku, and Constantinople, and reaching America on September 4. Prof. Davis and Mr. Huntington went north-east, crossing the western Tian Shan ranges to Lake Issikul, where they separated; Prof. Davis turned northward, and came home *viâ* Semipalatinsk, Omsk, and St. Petersburg; Mr. Huntington went south to Kashgar, and west to Samarkand and Askhabad, where he has lately arrived, and where he will make his winter headquarters, after an excursion into northern Persia.

AFRICA.

Count Wickenburg's Journey from Jibuti to Lamu.—We have already given, from a letter sent to us by the traveller himself, a short account of Count Wickenburg's journey through the Somali and Galla countries from Jibuti to Lamu (*Journal*, vol. xix. p. 216; xx. p. 338). A fuller account of the journey, accompanied by a valuable series of route maps, now appears in *Petermanns Mitteilungen*, Nos. 9 and 10, 1903. It is unnecessary here to do more than refer to the parts of the route which offer the greatest novelty from a cartographical point of view. Like so many of his predecessors, Count Wickenburg's southward march from the Hawash led him down the remarkable chain of lakes which is such an important feature of this part of Africa, but, as in previous cases, while almost all the lakes were touched at, and the shores of some followed for a considerable distance, the results suffer from the defects of all mere route-surveys, and leave many points still in uncertainty. It is much to be wished that some traveller would undertake a thorough survey of these lakes, and not be content merely to touch them in passing during a more extended journey.* For a route survey, Count Wickenburg's appears to have been carried out with great care, being based on a very large number of bearings of mountain peaks, etc., all of which are shown on insets on the separate sheets. His distances were estimated both by means of the pedometer and by the time taken on the march. The map of the lakes shows a good general agreement with those of Harrison and Neumann, at least as regards the parts actually visited, and is in many ways a great improvement on the map given in *La Géographie* for February last, based on the itinerary of M. Dubourg de Bozas. The nomenclature of the lakes seems still in a state of confusion. Thus the Hora (lake) Shale of Neumann appears as Hora Abjato, and the Hora Korre to the east, as Lake Kime. On the other hand, the name Shalla is given to the Lamina of Wellby, Harrison, and Neumann, in which respect the Austrian traveller agrees with M. Dubourg. The name Pagade is, perhaps accidentally, applied to the Chamo of Bòttego, who assigned it to the larger lake to the north (Abbai, or Abbaya). Count Wickenburg thinks that these two lakes once formed a single body of water. At the time of his visit, the periodic outflow of the lake towards the Sagan was dry, and he was unable to trace its course downward on account of the narrowness of the gorge through which it passes. On various points shown hypothetically on Count Wickenburg's map, further light will be thrown by the results of Captain Maud's surveys. As regards Lake Stefanie, which had been reported by previous travellers as having almost entirely disappeared, Count Wickenburg shows a considerable extent of water, though a tract to the south, once covered by the lake, is now dry; while the water is so salt as to be undrinkable, and the skeletons of crocodiles, etc., in its neighbourhood show that it no longer supplies the necessary conditions for these. The most novel part of the route was that south of Stefanie to the Rendile country, through districts hitherto quite untraversed. The general character of the country resembles that of the more southern area traversed by Dr. Donaldson Smith, and quite recently by Mr. Tate of the British East Africa Protectorate Service.* It is a vast waterless steppe, mainly volcanic in character, and apparently of recent formation, from which various ridges and peaks rise here and there. In the north Mount Kanjaro, with a height of 6900 feet, is the most prominent peak; while further south a continuous chain of conical hills, rising to some 5000 feet, runs from north-east to south-west for 50 miles. It is known as Huri (clouds) to the Oromo, but as Gagawa to the Rendile. Its flanks afford some pasturage. Still further south the Marsabit range, seen by Dr. Donaldson Smith, has some thick forest. Three well-marked craters occur in the range, the southernmost being apparently the site of the crater-lake of Sogorti, first mentioned by Dr. Smith. Koroli, spoken of by that traveller as a mountain, is in reality the dry bed of an old lake.

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* The recent survey by Captain Maud, the results of which are being worked up for publication by the Society, will further improve the mapping of this region, but some points are still left uncertain. Captain Maud accompanied Mr. E. A. Butter on his recent expedition, which returned last summer.

Explorations South of Insalah.—Recent French activity in the Central Sahara has added considerably to our knowledge of the geographical features of that region. We have already referred (*Journal*, vol. xxi. p. 322) to Lieut. Cottenest's military expedition against the Hoggar Tuareg, and the reconnaissance of the Muidir plateau carried out by Colonel Laperrine and the officers under his orders. The work of these parties has been extended by a subsequent expedition under Lieut. Guillo Lohain, whose narrative appears in the supplement to the *Bulletin du Com. de l'Afrique Française* for August, September, and October of the present year. While the general direction of the route was very similar to that of Lieut. Cottenest, the sections in which it was actually over the same ground formed but a small part of the whole, and during the march of over 2000 kilometres (1350 miles) many new details were added to the map. Lieut. Lohan made the circuit of the Hoggar *massif* (to which he gives the general designation Kudia), the precipices and gorges of which often proved formidable hindrances to the march with laden camels. He paid attention to the system of weds which run out from the *massif*, and which were in many cases well supplied with water and fringed with abundant vegetation. Those to the east of the plateau run to the south-east, and unite to form the Wed

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* We hope shortly to give a detailed account of Mr. Tate's interesting journey, which led to the Rendile country from the south.

Tin-Tarabin. The destination of those to the south could not be proved with certainty, but Lieut. Lohan thinks that they are lost in the Erg to the south and south-west, and that Deporter was mistaken in supposing that they make their way to the Igharghar. The head of the latter seems to be the Wed Tahifek, which rises further north in the Kudia at Mount Ikarhakar, and begins its course by flowing southward. On the return journey a *détour* was made to the west of the Kudia, a visit being paid to the important centre of Tit, situated on the large wed of the same name, and to the small settlement of Abalassa, placed beneath the spur of a range running from north to south, and possessing the best cultivation seen so far during the whole journey. Hence the "reg" was crossed in a northerly direction, the soil being very fine, but well compacted, and traversed by numerous small streams. Lieut. Lohan fully confirms Lieut. Cottenest's statement as to the excellence of the route to the west of the Kudia, which is said to continue good as far as Inazaua, north of Timbuktu. It is the great commercial route of antiquity, which has only been closed of late through the exactions of the Tuareg, now a thing of the past, as the country is under thorough surveillance by the French colonial troops. M. Gautier's visit to this region, to which allusion has already been made in the *Journal*, has likewise elicited some facts of interest, though a full account has not yet been published. In the *Annales de Géographie* for July 15 last, the traveller calls attention to the fact that the "Ahnet," the mountainous district south of Tidikelt, and the watering-place of Inzize on the route to Timbuktu, require to be shifted considerably to the east of their position on our maps, being probably south-east instead of south-west of Insalah. Inzize is a volcanic *massif*, in the centre of which is a tiny crater-lake which gives an unfailing supply of water. M. Gautier also speaks of the numerous rock drawings and inscriptions found in the Muidir plateau, which, though showing certain animals not now occurring in the district, represent as a whole the actual fauna, no drawings occurring of the elephant, rhinoceros, etc., often seen further north. The human figures include both naked foot-passengers and draped camel-riders. Various traces are still observable of the population which existed here before the Moslem invasion.

New Journey of M. de Mathuisieulx in Tripoli.—We lately reviewed the book in which the energetic French traveller, M. de Mathuisieulx, described his journey in 1901 into the interior of Tripoli—the first within recent years by which any decided additions to our knowledge had been made.[*] The traveller has, during the present year, carried out successfully a still more extended journey, some account of which is given in the supplement to the *Tour du Monde* for August 29 last. From Tripoli he went west along the coast to the site of the ancient fort Sabratha, of importance both in Phœnician and Roman times, the ruins of which he studied carefully. Then turning inland, he crossed the Jefara to the uplands of Jebel Nefusa, at the northern foot of which he came upon the interior Sabratha, now known as Sabria Jebel. In this region he discovered evident traces of the old Roman road from Tacape (Gabes) to Leptis Magna, about which there has been so much discussion, some holding that it passed far to the south through Ghadames, while others placed its course to the north of the Nefusa escarpment. In reality it ran along the northern edge of the uplands. The ruins along its course are in an advanced state of decay, as the inhabitants use the stones for building purposes, but M. de Mathuisieulx was able to identify some of the posts indicated by the Antonine Itinerary. After pushing south-west towards Ghadames for some distance, he retraced his steps, and, following the highlands east past Iffren, made a still further advance to the south-east, by Mizda and Ghirza, in the direction of Sokna. The country in this direction is a desolate stony desert, except in the wadis, where numerous traces of farms and forts are to be seen. The wadis Soffedjin, Ghirza, and Orfella were admirably cultivated in ancient times, but the position of the ruins shows that even then crops could only be grown on the lower grounds. The climatic conditions seem deteriorating at the present day, for the Mizda district, a most fertile spot at the time of Barth's visit, is now quite sterile by reason of the cessation of the rainfall. Returning to the coast by a direct route to the north, M. de Mathuisieulx examined the ruins of the ancient port of Kiniphos, the advanced post in this direction, returning to the capital by a route parallel to the coast. In addition to his archæological discoveries, he is said to have collected much material in regard to the geography, zoology, ethnography, etc., of the country. A full report will shortly be made to the Minister of Public Instruction, and will no doubt be published eventually, like that of the former journey, in the *Nouvelles Archives des Missions Scientifiques*. We understand that M. de Mathuisieulx contemplates continuing his explorations next year.

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[*] It has been stated in various quarters that no European traveller, except M. de Mathuisieulx, had been permitted to travel in the interior of Tripoli within recent years. This is not quite correct, for Mr. Dodson, it will be remembered, made his way to Murzuk two years ago.

AMERICA.

Dr. Hans Meyer in Ecuador.—Writing on September 12 from on board the *Prince Bismarck*, Prof. Hans Meyer gives, in the seventh number of the Berlin Geographical Society's *Zeitschrift*, a provisional account of an investigation carried out by him in the summer months of this year into the glaciation of the Cordilleras in Ecuador. Accompanied by the artist, R. Reschreiter, he made, in the beginning of June, a circuit of Chimborazo, ascending its east, south, north-west, and north sides into the region of perpetual snow and ice. In a second tour the immense crater of Altar yielded a particularly rich booty of glacial observations. Next, setting out from Latacunga, the travellers, in the face of an exceptionally heavy fall of new snow, covered in nine hours and a half the distance from the snow-line to the edge of the crater of Cotopaxi, found to be 1500 feet deep and 2600 feet wide. There was comparatively little steam rising from the crater. Then, on the north side of Quilindaña, they found old glacial traces suspected by W. Reiss, and others elsewhere. In spite of highly unfavourable weather at Carihuairazo, Prof. Meyer was able to determine the much larger glacial formation once existing there. A tour from Quito to Antisana turned out highly helpful to an understanding of the present and past glaciation of this mighty snow-mountain. Inclement weather frustrated a visit to Cayambe, but an ascent of the western peak of Chimborazo to a height of 20,000 feet was made from the north-west. Prof. Meyer brings home abundant geological and botanical collections, as well as photographs and pencil sketches. The fuller report of his successful expedition will be awaited with interest.

Progress of the Austrian Expedition to Eastern Brazil.—Letters from Dr. Steindachner, giving an account of the progress of his expedition (see *ante*, p. 88) down to June 6 last, are printed in No. 7–8 of the *Mitteilungen* of the Vienna Geographical Society. From Barra do Rio Grande, on the São Francisco, a voyage of fourteen days was made up the Rio Grande and its large and swiftly flowing tributary the Rio Preto, to the small settlement of Santa Rita. This river voyage possessed unusual fascinations for the travellers, and the winding nature of the streams allowed them frequently to traverse the neighbouring forests on foot between one halting-point and the next. The Rio Grande twice breaks through the mountains in nearly a right angle between Barra and the mouth of the Rio Preto. The latter stream has clear and dark water, which contrasts strongly with the clayey water of the Rio Grande. Its banks are thickly wooded, and characterized by two species of palms, known as Butiri and Butirana—the former said to be a veritable king among Brazilian palms. Several capybaras were captured alive, while the first crocodile was shot on the river, and blue Araras were seen there for the first time. The abundance of mosquitos during the last five days was the only drawback to the delight experienced in the constant observation of fresh novelties. An overland march from Santa Rita brought the travellers to Parnagua, in the basin of the Parnahyba, one of the main objectives of the expedition. Here daily excursions were made by land and water, and the collections increased rapidly. Dr. Steindachner frequently fished in the beautiful lake, some 4 miles long, on the borders of which the small village is placed. At the time of writing, the expedition was about to start overland for S. Filomena, on the upper Parnahyba (a twelve days' ride), and, as one of the members of the party, Dr. Penther, was suffering a good deal from rheumatism, it was thought better that he should return to Europe by the route already traversed.

Peruvian High-altitude Railways.—The line between Oroya, the terminus of the Central railway, and Cerro de Pasco (14,000 feet) will, it is expected, be finished before the end of the present year. The summit level is at the great altitude of 15,680 feet. A short line connecting the Morococha mining district with the Central railway has recently been completed by the Peruvian corporation. It branches off at Ticlio, about 15,500 feet above sea-level, rises some 135 feet higher, and then descends to 14,900 feet.

POLAR REGIONS.

Captain Amundsen's Expedition.—The Dundee whalers which returned from Davis straits in November report that no sign was seen of Captain Amundsen or his vessel at the rendezvous which had been arranged at Dalrymple rock, near Smith sound, where Captains Milne and Adams arrived on June 26. The ice and weather conditions are said to have been very unfavourable this year, and fears have been expressed for the safety of the explorer, owing to the small size of his vessel. It may be pointed out, however, that Captain Amundsen's failure to be at the rendezvous at the appointed time would be due to the unavoidable postponement of his date of sailing. A large quantity of stores was left at Dalrymple rock.

The Danish Expedition to West Greenland.—The Dundee whalers referred to in the preceding note met Mr. Mylius Erichsen and his party (*Journal*, vol. xix. p. 641; vol. xxi. p. 325) in the neighbourhood of Dalrymple rock. The news of the explorers is not reassuring, Count Moltke being at the time very ill, and the whole party living among the Eskimo, in a state of great destitution, on Saunders island. The whalers were unable to convey them to Greenland, but gave them some supplies and wood to build a boat, their own having been abandoned in Melville bay. It is feared that if an attempt was made to leave the island the party would certainly have perished in the terrific weather that followed, but it is hoped that they may have decided to remain for the time being with the Eskimo. It is possible that they may since have fallen in with Captain Amundsen. Some details of the doings of the party during the early part of the year were given in the eighth number of *Petermanns Mitteilungen* for the present year (p. 192). The winter had been spent at Jacobshavn, whence the party started north in sledges during February, reaching Saunders island towards the end of April.

Currents in the Arctic Ocean.—At a recent meeting of the Imperial Russian Geographical Society, Mr. Knipovich read a paper on "The Warm Currents in the European Part of the Arctic Ocean." As is known, a branch of the so-called Gulf Stream divides into two after rounding the North cape. One portion goes along the western coast of Spitsbergen, while the second, taking a course between North Cape and Bear island, penetrates into the comparatively shallow Barents sea. Here, near to the meridian of Kola, it subdivides into four branches, the southern of which is called by Mr. Knipovich the Murman Warm Current. The author observed that these currents had a very regular and permanent direction. The current going to Spitsbergen sends an under-current to the Storfjord, and, continuing its course, also becomes an under-current near the north-western end of Spitsbergen; afterwards turning to the east, it enters the deep basin which Nansen found to exist in the Arctic ocean. These observations are in full accordance with the researches of Admiral Makaroff in the *Yermak* in 1899. Concerning the yearly variation of temperature at various depths, Mr. Knipovich obtained the following results. The penetration of heat from the surface is very slow; for instance, along the Murman coast the water at a depth of 200 or 250 metres reaches its highest yearly temperature three months later than the surface. Especially slow is the penetration of heat in those parts of the sea which are separated from each other by the rise of the sea-bottom, as, for instance, in some parts of the White sea. The beneficial influence of these warm currents is best observed in the distribution of ice in the Murman current. The latter forms a barrier against the advance of ice to the south, owing to which the Murman coast is free from the ice coming from the Arctic ocean.

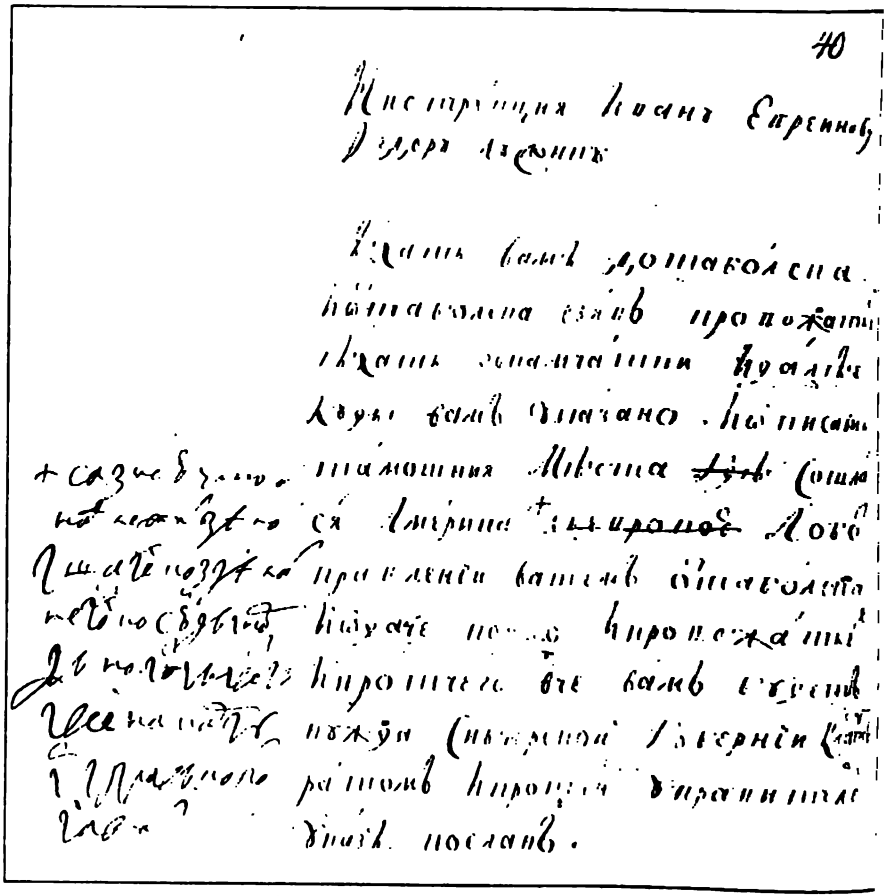
The British and German Antarctic Expeditions.—The *Terra Nova* arrived at Hobart on October 31, the voyage from Aden having been made under most favourable conditions, and completed well under the anticipated time. The *Morning* arrived a few days later, and the two ships will proceed south, if present plans are adhered to, on December 4. The *Gauss* arrived at Punta Delgada, in the Azores, at the end of October, having done some excellent oceanographical work during her cruise in the Atlantic. She is expected home during December.

Safety of Dr. Otto Nordenskiöld's Party.—The arrival of the Argentine gunboat *Uruguay* at Rio Gallegos, with the members of Dr. Nordenskiöld's expedition on board, was announced by telegram from Buenos Aires on November 23. The officers had been found on Louis Philippe Land, and the remaining members on Seymour island. This news will be everywhere received with lively satisfaction, as some anxiety had been felt as to the fate of the party. Dr. Nordenskiöld had made a journey of over 400 miles as far south as 66° in 62° W. long., adding considerably to our knowledge of the region explored by the Belgian expedition. It is stated that the *Antarctic* was crushed by ice on February 12, 1903. The *Uruguay*, sent by the Argentine Government in search of the missing party, was under the command of Commander Irizar, of the Argentine Navy, formerly naval attaché at the Legation in London. Dr. Charcot, who proposed to join in the search, will now devote his energies to scientific research in the Antarctic.

GENERAL.

Peter the Great and Geographical Exploration.—The interest taken by Peter the Great in the preparations for Bering's famous expedition of 1725 and following years is well known, the instructions for the conduct of the expedition having been drawn up by the emperor himself not long before his death. It is less generally known that a similar expedition, for the purpose of elucidating the physical relations existing between Asia and America, was organized as early as

1719, in which year a commission was entrusted by the emperor to the geodesists Evreinov and Lushin for that object. Through the courtesy of our Honorary Corresponding Member, Baron von den Osten-Sacken, we have been favoured with a photographic facsimile (here reproduced on a somewhat reduced scale) of the instructions given by Peter the Great to the intended explorers before they left St. Petersburg. A special interest attaches to the document by reason of the fact that corrections and additions were made by the emperor's own hand, being written, as will be seen in the facsimile, on the margin of the paper. Our correspondent gives a French translation of the document, which (as it originally stood) may be rendered in English thus: "You are to proceed to Tobolsk, and from Tobolsk, after procuring guides, to make your way to Kamchatka and beyond, according to the directions which have been given you, making a survey of the localities *where* America meets Europe (*sic*). As concerns your journey to Tobolsk, orders have been given to the Landraths and other rulers of the Siberian province to furnish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PETER THE GREAT'S INSTRUCTIONS FOR A VOYAGE OF DISCOVERY BETWEEN ASIA AND AMERICA, 1719.

you with horses and guides, and everything of which you may stand in need." The emperor has erased the word "where," printed above in italics, and has replaced "Europe" by "Asia," adding the words, "which must be done with great care—not only [as regards] the south and north, but also the east and west, laying everything down exactly on the map." The little that is popularly known of this expedition * arises, no doubt, from its failure to set at rest the disputed question, the furthest point reached being one of the Kurile islands. Some account of it is, however, to be found at p. 36 of K. E. von Baer's monograph, entitled "Peter's des Grossen Verdienste um die Erweiterung der geographischen Kentnisse" (1872), which forms the sixteenth volume of the well-known 'Beiträge zur Kenntniss des Russischen Reichs.' A brief account is also given in Jefferys' translation of Muller's narrative of the Russian voyages (p. 44).

OBITUARY.

The Hon. George Charles Brodrick, LL.B., D.C.L.

It is with much regret that we have to record the death of the Hon. George C. Brodrick, who has been a Fellow of the Society for forty years, and for much of that time a member of the Council and a Vice-President. Mr. Brodrick was the second son of the seventh Viscount Midleton, and was born on May 5, 1831, at Castle Rising, in Norfolk, where his father, who became successively Canon of Wells and Dean of Exeter, was then rector. He was educated at Eton and Balliol College, Oxford, where he had a distinguished career, obtaining a double first-class, as well as the Arnold Historical and English Essay Prizes. He took his degree in 1854, and the next year was elected a Fellow of Merton College. In 1858 he carried off the Law Scholarship at the University of London, where he obtained the degree of LL.B. Mr. Brodrick was called to the bar from Lincoln's Inn in 1859, and for some years practised as a barrister on the Western circuit, but eventually he turned from the law to journalism. He is known to have contributed largely, and for the most part anonymously, to the daily press, mainly the *Times* and leading periodicals. He edited in 1865, in conjunction with the Dean of Ripon, 'The Ecclesiastical Judgments of the Privy Council.' In 1880 a selection of his articles and essays were republished under the title of 'Political Studies,' and in the following year he published a work entitled 'English Land and English Landlords.' His latest contributions to literature are mainly connected with academical history, and include the 'Memorials of Merton College,' and a 'History of the University of Oxford.' Quite recently he published 'Memories and Impressions, 1831–1900.' Mr. Brodrick stood three times for Parliament as a Liberal, but each time he had the misfortune to be unsuccessful. He was elected to the Wardenship of Merton College in February, 1881, in place of the late Dr. Bullock-Marsham, which office he held until the end of the last vacation, when he resigned on account of failing health.

In referring to Mr. Brodrick's death at the meeting of the Society on November 10, the President said: "I cannot begin the business of the evening without a reference to the great loss the Society has sustained in the death of the late Warden of Merton. Mr. George Brodrick was a man so well known in journalism, in literature, and in society that it is unnecessary, in offering a tribute to his memory, that we should go beyond his services to ourselves, which have been great, and will be enduring. Mr. Brodrick was our oldest councillor, for his service on our Council began in the days of Sir Roderick Murchison. For thirty-four years he has been on our Council, with brief intervals of rest, and in those intervals we always felt his absence. He took a leading part, from the very first, in all measures connected with geographical education; and I always remember that it was Mr. Brodrick who, in 1879, seconded and supported me in my efforts to establish a system of scientific instruction in this Society, and that for some time we stood alone. Of late years he has worked with me in the representation of our Council on the committee of the Oxford school of geography; his influence did much to establish that school on a solid basis. Mr. Brodrick was cautious, and at the same time judicious in counsel, and his advice was always carefully considered and absolutely impartial. He was inclined to compromise and to conciliation. Thus he helped us over many difficulties, smoothed over rough places, steered us through dangerous channels, and was a powerful influence in maintaining peace and friendly understandings among us. In him I mourn an adviser on whom I could always rely, a friend who never failed in need. He was looking forward, only last week, to more leisure and closer devotion to our interests. But it was ordained otherwise. The Society has indeed sustained a heavy loss. It will be long before we shall again find so wise and trusty a councillor as George Brodrick."

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* No mention, *e.g.*, is made of it either in Coxe's 'Russian Discoveries,' or in Burney's 'North-Eastern Voyages of Discovery,' or by Baron Nordenskiöld in his sketch of Russian northern and eastern discoveries given in the 'Voyage of the Vega.'

Sir Charles Nicholson, Bart., D.C.L., LL.D.

Sir Charles Nicholson, whose death occurred at the advanced age of ninety-four years, at his residence at Totteridge, on November 8, was one of the oldest members of our Society. He became a Fellow in 1856, and served on its Council from 1863 to 1868 and from 1870 to 1875. He contributed to the *Proceedings*, and frequently took part in the discussions at the evening meetings. The deceased, who was the son of Mr. Charles Nicholson, of London, was educated in Edinburgh, where he graduated as M.D. in 1833. In the following year he became a resident in New South Wales, where he practised as a physician with distinction, and soon identified himself with the social and political interests of the colony. He was one of the original representative members for Port Phillip (now the colony of Victoria), in the first Legislative Assembly established in New South Wales in 1843, and three times held the office of Speaker of that Chamber. He was a powerful helper in organizing the public institutions of the country, and his name was specially connected with the work of the foundation of the University of Sydney, of which he filled the post of Vice-Provost, and subsequently that of Chancellor, from 1854 to 1860. He endowed it with valuable gifts, among them being the fine painted windows which adorn the hall of the University, and a splendid collection of Egyptian antiquities. On the occasion of the jubilee of the University, in September last year, Sir Charles received the following telegram from Sydney:—"Senate and members of Sydney University assembled to celebrate jubilee, recognize the goodness of Providence in prolonging your life to see this day, and thank you for your good wishes and continued interest in the university whose steps you guided with so much sagacity and foresight.—Maclauren, Chancellor." He received the honour of knighthood in 1852, and was created a baronet in 1859. The honorary degree of D.C.L. was conferred upon him by the University of Oxford, and that of LL.D. by the University of Cambridge. He is the author of various official papers and reports connected with colonial, economic, and educational affairs, and has also written articles in the *Transactions* of the Royal Society of Literature, of which he was Vice-President, containing an account of exploration in Upper Egypt and at Memphis. He was one of the original founders of the Royal Colonial Institute. In 1865 he married Miss Keightley, and is succeeded in the baronetcy by his son Charles Archibald.

CORRESPONDENCE.

The Survey of the Mustagh Range.

In the November number of this *Journal*, p. 541, Dr. Hunter Workman gives an interesting account of his summer tour to Baltistan, accompanied by his wife, a surveyor, and Swiss guides, following up a few glaciers to their sources. Two remarks in the paper, combined with previous similar notices in their book, 'In the Ice-World of Himalaya,' require from me some explanation, otherwise they would lead the general reader to say how very inaccurately this Indian Survey work was done, and to imagine that the Kashmir survey was badly carried out. Certainly some readers require to be informed as to the conditions under which the survey of this part of the Mustagh range was conducted, and to what extent absolute accuracy was attainable.

I am solely responsible for all the topography of the Shigar river from Skardo to its glacial sources, and am now one of the very few left of the survey party who, under Captain T. G. Montgomerie, R.E., began and carried out the survey of Kashmir territory. In June, 1861, when I received my orders, the whole drainage system of the Shigar river, with its two great branches, the Basha and the Braldo, was mostly *terra incognita;* my plane-table section for that summer's work embraced the whole of it, and a good deal more. The only European travellers who had previously seen the ends of the larger glaciers were Vigne, Dr. Thomson, and one of the Schlagintweits. Adolphe had gone up the Punmah glacier in an attempt to cross the Mustagh pass into Yarkand. The Biafo glacier had been seen; the Baltoro and Hisper were unknown to us of the Survey. The work is geographical reconnaissance, and the amount and accuracy of detail shown depends on the number of points fixed by triangulation, and the character and value of the ground. Beyond a few of the most conspicuous peaks, there were no trigonometrical stations in the area I had to sketch, so that, as a preliminary to that summer's work, I had first to ascend several peaks, of about 1700 feet, near Skardo, to get rays over all the mountain mass on the north. The result of my reconnaissance —it does not profess to be anything more—is to be found on the sheets of the Indian Atlas, Nos. 27 A and 44 A.

Before starting, Captain Montgomerie suggested my taking a 7-inch theodolite, but we decided finally that the topography was the most important, and that waiting at stations taking angles would only be wasting the too short summer in that region. The most important part of topographical maps on an unknown frontier is the laying down of all routes and passes, all villages, with the rivers on which they are situated, and next the run of the main ranges. The details of the higher valleys in their more inaccessible parts, covered with perpetual snow and ice, and never visited by the natives of the country, are of no interest or importance except to the alpine climber. It was impossible, in the time at my disposal, to do more than sketch by eye the heads of glaciers and snow-fields, often at a long distance, from some lofty point when the mountains were clear.

Here I may say that the great aim of the Survey Department and the Quartermaster-Generals in India has been to get maps of the frontier, and no part was so important as that of the north-west. Political relations even with Kashmir were not as they are to-day; we never knew from year to year, and in 1857 from week to week, whether or no some hitch might occur which would render the carrying on of the survey difficult, or even stop it altogether.

Just then the Maharajah of Kashmir was assisting us, although Runbeer Singh looked less favourably on it than his father, Goolab Singh, did; thus the importance of rapid topographical work at that time. All this is not so apparent to travellers in that country to-day, who are inclined to say, "Why was the work not done better?"

The Hoh Loomba, lately visited by the Bullock Workman alpine party, is a good example of what had to be left unvisited upon its course above the villages of Hoh and Naugmani Tapsa. Dr. Workman writes (p. 541), "As in the case of the Choga Lungma, they found the course of this glacier quite different from that laid down in the Indian Trigonometrical Survey map." I never set foot on the glacier; and from near its snout could only sketch in its general direction, while peaks on the range bordering the Hisper glacier were seen from Busper peak and other points. And I was told that, by a pass at its head, it was possible to get to the Hisper glacier. Had I laboured at what was then useless detail up this comparatively small tributary, I should never have reached Arundu, gone up the Chogo Lungma glacier and the Kero Lungma, fixed the Nushik La, and approximately the position of Hunza Nagar, all much more important topographically at that time.

My reply is similar as regards the Orcho Alchoro glacier, of which Dr. Workman says (p. 544), "This glacier is also wrongly defined on the Survey map." It is, no doubt, a very interesting branch of the Kero Lungma, but very unimportant in its details of branches and icefalls, etc., at the period I was making the first map of this intricate portion of the Himalayas. On my return to Arundu on September 10, I had still before me the Ganto La and the Indus valley down to Rondu to map.

The conditions and objects under which I was working in the summer of 1861 cannot be compared with those of travellers like Mr. and Mrs. Bullock Workman, who spend their summer on a few glaciers only, and look up all their details, with ample leisure to make ascents of peaks and gain record boiling-point observations. Every credit is due to them for undertaking even this laborious work, entailing exposure and discomfort. Perhaps the most important result will be the detailed survey on larger scale which Mr. B. Hewett has made; this cannot fail to be very valuable additional topography to be inserted later on in the early and far less elaborate work, and no one looks forward with more interest to seeing this than I do.

For the information of future travellers seeking pleasure on snow and ice, I must point out there are many portions of the Indian Survey map of this part of the Mustagh range that were never visited, and are very inaccurate in the high ground at the heads of the glaciers. There is plenty of work in exploring them and mapping them, even if only with a prismatic compass, or, better, a handy plane-table. One I might especially mention—the Shingkan Lungma, which joins the river from the Boltoro glacier opposite Burdomul halting-ground. I could not get near it; all my supplies were exhausted. Only the general line of the valley is laid down; the rest is all the roughest eye-sketch. Another fine tour to see what a glacier is like would be to the Punmah and up to the sources of its two great branches, the Nobundi Sobundi and Choktoi glaciers.

H. H. GODWIN-AUSTEN,
Lieut.-Colonel.

Nore, Godalming, November 7, 1903.

MEETINGS OF THE ROYAL GEOGRAPHICAL SOCIETY, SESSION 1903–1904.

First Ordinary Meeting, November 4, 1903.—Sir CLEMENTS MARKHAM, K.C.B., F.R.S., President, in the Chair.

ELECTIONS:—*Lionel Forbes Bridges; Captain Frederick F. Carroll, R.A.M.C.; Cumberland Clark; Lieut. Thomas Sands Cox* (16*th Bengal Lancers*)*; Major William Cox* (*Somerset Light Infantry*)*; Lieut.-Colonel Charles Merewether Ducat* (4*th Bombay Cavalry*)*; Lieut.-Colonel K. M. Foss* (*Indian Army*)*; B. O. Ingham; Right Hon. Sir Hugh M. Nelson, P.C., K.C.M.G., D.C.L.; Lieut. G. W. Palmer* (1*st West India Regiment*)*; David Richardson.*

The Paper read was:—

"Northern Nigeria." By Brig.-General Sir Frederick D. Lugard, K.C.M.G., C.B., D.S.O.

Second Ordinary Meeting, November 10, 1903.—Sir CLEMENTS MARKHAM, K.C.B., F.R.S., President, in the chair.

ELECTIONS.—*Lieut. Boyd Alexander* (*Rifle Brigade*)*; Charles R. Arlen; F. S. H. Baldrey; James Brierley, junr.; George Edmond Bright; Major W. A. Boulnois, R.A.; Lieut. E. L. D. Boyle, R.N.; Lieut. Bernard Arnold B. Butler* (*Royal Field Artillery*)*; Sackville W. Caldbeck; Arthur Cecil Chapman; George John Christian; John Gardner Coolidge; Augustus Dutton; Hari Das Das; J. A. Douglas* (2*nd Bengal Lancers*)*; Dr. John William Evans; William Francis B. Edwards* (*Lieut.* 24*th P. Infantry*)*; Major J. E. Fowle* (*Bedfordshire Regt.*)*; Captain Baron Albert D. Furse; Sir William Edmund Garstin, G.C.M.G.; John R. Griffith; Charles Guttmann; Cecil Jackson Redfern Gardiner, J.P.; Frank Arthur Harris; Joseph Wm. Hayward, M.Sc.; Captain Lewis Egerton Hopkins, R.E.; Alexander Huskie Hicks-Bratt; Henry Heath; Harry Edward Howard; Stephen A. Ionides, B.A.; John Jackson; James John Joicey; Stanley A. Kisch; George Jardine Kidston; Major George Leslie, R.E; Aubrey Le Blond; E. Lang; James Logan; David Lockhart Lorimer; Sub-Lieut. Cuthbert D. Longstaff, R.N.; Gilbert C. Longstaff; Campbell Alexander MacAllum; Surg.-Lieut.-Colonel James Magill, M.D., C.B.; Lieut.-Colonel E. S. May, R.A., C.M.G.; Sidney Allcroft Budgett Meakin; John Herbert Milton; C. E. Bruce-Mitford; Frank Hudson Modder; George McKay Morant; Monsieur le Duc de Morny; Charles Norman Morrison; John R. Mott; Lieut. Murray Muirhead, R.A.; Charles Kenneth Murchison; Charles G. A. Nix; Richard Norton; Captain J. O'Kinealy* (*West African Frontier Force*)*; Captain Claud A. Percival* (*Rifle Brigade*)*; William Davidge Page; General Sir Arthur Power Palmer, G.C.B., G.C.I.E.; Laurence Pullar, F.R.S.E.; Herbert Richmond Palmer, B.A., LL.B.; George Petrides; James Parke Rawlins; Lieut.-Colonel Sir John Rogers, D.S.O., K.C.M.G.; Robert Ferguson Savage; John Maximilian Schmidl; Major Harry Spencer Scott-Harden* (*Colonial Forces*)*; Captain J. D. Sherer, R.A.; Lieut. Alfred Aquila Smith* (5*th Punjab*)*; William John Sugden; H. N. Sulivan; Harold William Tyler; Walter Beaupré Townley; Percy Alfred Talbot; Washington B. Vanderlip; Lieut.-Colonel Willoughby Verner; Major C. Wanliss* (*Lancashire Regt.*)*; Captain T. M. Wakefield, R.A.; John Nimmo Wardrop; Wm. E. West; Henry White; Robert St. John Willans* (5*th Fusiliers*)*; Stephen Wand; Levi Walter Yaggy.*

The Paper read was:—

"North Polar Exploration, 1898–1902." By Commander R. E. Peary, U.S.N.

GEOGRAPHICAL LITERATURE OF THE MONTH.

Additions to the Library.

By **EDWARD HEAWOOD, M.A.,** *Librarian*, **R.G.S.**

The following abbreviations of nouns and the adjectives derived from them are employed to indicate the source of articles from other publications. Geographical names are in each case written in full:—

A. = Academy, Academie, Akademie.
Abh. = Abhandlungen.
Ann. = Annals, Annales, Annalen.
B. = Bulletin, Bollettino, Boletim.
Com. = Commerce.
C. Rd. = Comptes Rendus.
Erdk. = Erdkunde.
G. = Geography, Geographie, Geografia.
Ges. = Gesellschaft.
I. = Institute, Institution.
Iz. = Izvestiya.
J. = Journal.
k. u. k. = kaiserlich und königlich.
M. = Mitteilungen.
Mag. = Magazine.
Mem. = Memoirs, Mémoires.
Met. = Meteorological.
P. = Proceedings.
R. = Royal.
Rev. = Review, Revue.
S. = Society, Société, Selskab.
Sitzb. = Sitzungsbericht.
T. = Transactions.
V. = Verein.
Verh. = Verhandlungen.
W. = Wissenschaft, and compounds.
Z. = Zeitschrift.
Zap. = Zapiski.

On account of the ambiguity of the words *octavo*, *quarto*, etc., the size of books in the list below is denoted by the length and breadth of the cover in inches to the nearest half-inch. The size of the *Journal* is 10 × 6½.

A selection of the works in this list will be noticed elsewhere in the "Journal."

EUROPE.

Adriatic Sea. *Deutsch. G. Blätter* **26** (1903): 71-92. **Stavenhagen.**
Das Adriatische Meer. Von W. Stavenhagen.

Alps. **Baedeker.**
The Eastern Alps, including the Bavarian Highlands, Tyrol, Salzburg, Upper and Lower Austria, Styria, Carinthia, and Carniola. Handbook for Travellers. By Karl Baedeker. Tenth Edition. Leipsic: K. Baedeker; London: Dulau & Co. 1903. Size 6½ × 4, pp. xxvi. and 572. *Maps and Plans. Price* 10*m. Presented by Messrs. Dulau & Co.*

Austria. **Diener, etc.**
Bau und Bild Österreichs. Von Carl Diener, Rudolf Hoernes, Franz E. Suess, und Victor Uhlig. Mit einem vorworte von Eduard Suess. Wien: F. Tempsky; Leipzig: G. Freytag. Size 11 × 7½, pp. xxiv. and 1110. *Maps and Illustrations. Price* 65*s.* [To be reviewed.]

Austria—Tyrol. **Haushofer.**
Tirol und Vorarlberg. Von Prof. Max Haushofer. (Land und Leute. Monographien zur Erdkunde. iv.) Bielefeld und Leipzig: Velhagen and Klasing, 1903. Size 10½ × 7, pp. 206. *Map and Illustrations. Price* 4*s.*

Belgium. *B.A.R. Belgique* (1903): 484-491. **Vercoullie.**
L'étymologie de Vlaming et Vlaanderen. Par J. Vercoullie.

France—Coasts. **Lenthéric.**
Côtes et Ports Français de la Manche. Par Charles Lenthéric. Paris: Plon Nourrit & Cie., 1903. Size 7½ × 4½, pp. iv. and 318. *Maps. Price* 5*s.*

An excellent summary of the physical and economic geography in their relation to the coasts of Northern France history.

France—Guides—Cantal. **Boule and Farges.**
Le Cantal. Guide du Touriste, du Naturaliste et de l'Archéologue. Par Marcellin Boule et Louis Farges. Paris: Masson et Cie., [N.D.]. Size 7 × 4½, pp. 316. *Maps and Illustrations. Price* 3*s.* 6*d.*

France—Guides—Lozère. **Cord and Viré.**
La Lozère. Causses et Gorges du Tarn. Guide du Touriste, du Naturaliste et de l'Archéologue. Par Ernest Cord, Gustave Cord, et Armand Viré. Paris: Masson et Cie., 1900. Size 7 × 4½, pp. iv. and 290. *Maps and Illustrations. Price* 3*s.* 6*d.*

France—Guides—Savoy. **Le Roux.**

La Haute-Savoie. Guide du Touriste, du Naturaliste, et de l'Archéologue. Par M. Marc Le Roux. Paris: Masson et Cie., [N.D.]. Size 7 × 4½, pp. viii. and 338. *Maps and Illustrations. Price* 3*s.* 6*d.*

France—Guides—Savoy. **Révil and Corcelle.**

La Savoie. Guide du Touriste, du Naturaliste et de l'Archéologue. Par Joseph Révil et Joseph Corcelle. Paris: Masson et Cie., [N.D.]. Size 7 × 4½, pp. vi. and 280. *Maps and Illustrations. Price* 3*s.* 6*d.*

These guides occupy a position that has not been filled by other works of the kind, being especially useful to the educated tourist for the excellent bird's-eye view they give of the general physical geography, history, and archæology of the districts with which they deal.. These sections extend to quite half the space alloted to the whole book.

France—Orleans. *Ann. G.* **12** (1903): 307-323. **Blanchard.**

Le Val d'Orleans. Par R. Blanchard. *With Map.*

Germany. *Abh. K.P.A.W. Berlin* (1902): 1-132. **Branco.**

Das vulcanische Vorries und Seine Beziehungen zum vulcanischen Riese bei Nördlingen. Von W. Branco. *With Map.*

Germany. **Schulz.**

Die halophilen Phanerogamen Mitteldeutschlands. Von Dr. August Schulz. Sonderabdruck aus der "Zeitschrift für Naturwissenschaften," Bd. 75. Stuttgart: E. Schweizerbart'sche Verlagshandlung (E. Nägele), 1903. Size 9 × 6, pp. 257-293. *Map.*

Germany—Eichsfeld. *M.V. Erdk. Halle* (1903): 77-127. **Nehmer.**

Beiträge zur Landeskunde des Eichsfeldes. Von Dr. A. Nehmer. *With Maps and Profiles.*

Germany—Harz Mountains. *M.V. Erdk. Halle* (1903): 56-62. **Luedecke.**

Ueber die gleiche geognostische Beschaffenheit von Brocken und Kiffhäuser. Von Prof. Dr. O. Luedecke.

Germany—Historical. **Knüll.**

Historische Geographie Deutschlands im Mittelalter. Von Dr. Bolo Knüll. Breslau: F. Hart, 1903. Size 9½ × 6½, pp. viii. and 240. *Price* 4*s. Presented by the Publisher.*

In this instructive monograph the author discusses in turn the changes in the natural features (coasts, etc.), the movements of population, forms of settlement, roads and waterways, changes in the fauna and flora, etc.

Germany—Lakes. *M.V. Erdk. Halle* (1903): 74-77. **Halbfass.**

Ueber Einsturzbecken am Südrand des Harzes. Von Prof. Dr. W. Halbfass. *With Maps.*

Germany—Rhine-Hessen. **Schopp.**

Beiträge zur Kenntnis der diluvialen Flussschotter im westlichen Rheinhessen. Von Prof. Dr. H. Schopp. Size 10 × 8½, pp. 10. *Map. Presented by the Author.*

Germany—Thuringia. **Scobel.**

Thuringen. Von A. Scobel. (Land und Leute. Monographien zur Erdkunde, i.) Zweite Auflage. Bielefeld and Leipzig: Velhagen & Klasing, 1902. Size 10½ × 7, pp. 160. *Maps and Illustrations. Price* 4*s.*

Italy—Venice. **Zwiedineck-Südenhorst.**

Venedig als Weltmacht und Weltstadt. Von Hans v. Zwiedineck-Südenhorst. (Monographien zur Weltgeschichte, viii.) Bielefeld und Leipzig: Velhagen & Klasing, 1899. Size 10½ × 7, pp. 208. *Plates and Illustrations. Price* 4*s.*

Russia. *B. Comité Géolog. St. Petersbourg* **21** (1902): 641-651. **Derjavin.**

Observations géologiques dans la partie sud-occidentale de la Russie d'Europe. Par A. Derjavin. [In Russian.]

United Kingdom—London. **Ordish.**

Annual Record of the London Topographical Society. 1900. Including the Reports of the first three Annual Meetings of the Society. Edited by T. Fairman Ordish. London, 1901. Size 9 × 5½, pp. xii. and 114. *Illustrations. Presented by the London Topographical Society.*

The illustrations give a good idea of the neighbourhood of the Strand in former days.

United Kingdom—Rainfall. **Wallis and Mill.**

British Rainfall, 1902. On the Distribution of Rain over the British Isles, during the year 1902, as observed at about 3500 stations in Great Britain and Ireland, with articles upon various branches of rainfall work. Compiled by H. Sowerby Wallis and Hugh Robert Mill. London: E. Stanford, 1903. Size 8½ × 5½, pp. 250. *Diagrams and Illustration. Price* 10*s*. *Presented by the Compilers.*

The first article discusses the rainfall observations at Camden Square for the past forty-five years, the mean monthly distribution being shown by a diagram. October comes out as distinctly the wettest month, the curve rising fairly evenly from a minimum in March, and falling again with equal regularity.

United Kingdom—Scotland. *T. Edinburgh Geolog. S.* 8 (1903): 194–196. **Cadell.**

Note on the buried River-channel of the Almond. By H. M. Cadell.

United Kingdom—Tide Tables. **Harris and Havergal.**

Tide Tables for the British and Irish Ports, for the year 1904: also the Times and Heights of High Water at Full and Change for the principal places on the Globe. By Captain H. R. Harris and Commander A. Havergal. London: J. D. Potter. Size 10 × 6½, pp. xi. and 262. *Price* 2*s*.

United Kingdom—Wales. **Bradley.**

Highways and Byways in South Wales. By A. G. Bradley. London: Macmillan & Co., 1903. Size 8 × 5½, pp. xii. and 418. *Map and Illustrations. Price* 6*s*. *Presented by the Publishers.*

This volume quite sustains the reputation of the series for readableness and tasteful appearance.

ASIA.

Asia—Commerce. **Bray.**

La Belgique et le Marché Asiatique. Par A. J. de Bray. Bruxelles: Imp. Pollewnis & Centerick, 1903. Size 9½ × 6½, pp. xii. and 384. *Maps and Diagrams. Presented by the Author.*

The scope of this work is wider than its title might suggest. It really deals with modern conditions of trade in Asia as carried on by the principal commercial nations of Europe. A separate section is devoted to each of the European spheres and native states, a comparative view being given of the commercial position, in each, of the several nations.

Central Asia. **Hedin.**

Central Asia and Tibet: Towards the Holy City of Lassa. By Sven Hedin. 2 vols. London: Hurst & Blackett, 1903. Size 10 × 7, pp. (vol. i.) xviii. and 608; (vol. ii.) xiv. and 664. *Maps and Illustrations. Price* 42*s*. *net. Presented by the Author.*

China. **Parker.**

China Past and Present. By Edward Harper Parker. London: Chapman and Hall, 1903. Size 9 × 5½, pp. xii. and 424. *Map. Price* 10*s*. 6*d*. *net. Presented by the Publishers.*

A series of sketches on Chinese history and manners, as well as on European relations with the Chinese Empire. Most are reprinted from magazines and other publications, but in many cases the matter has been extensively revised and re-cast to bring it up to date. Like Mr. Parker's other works, the book contains a good deal that merits attention.

China—Ethnology. *J. Anthrop. I.* 33 (1903): 96–107. **Henry.**

The Lolos and other tribes of Western China. By A. Henry. *With Plates.*

China—Historical. **Tschepe.**

Variétés Sinologiques No. 22. Histoire du Royaume de Tch'ou (1122–223 av. J.C.) Par le P. Albert Tschepe. Chang-Hai, 1903. Size 10 × 6½, pp. ii. and 402. *Map. Price* $5.

One of a valuable series of memoirs published by the French Jesuits at Shanghai.

China—Manchuria. *Kolon. Z.* 4 (1903): 261–264. **Corbach.**

Dalni, Russlands wirtschaftspolitischer Stützpunkt in der Mandschurei. Von E. Corbach.

China—Nankin. **Gaillard.**

Variétés Sinologiques No. 23. Nankin d'alors et d'aujourd'hui. Aperçu Historique et Géographique par le P. Louis Gaillard. Chang-Hai, 1903. Size 10 × 6½, pp. vi. and 350. *Illustrations, etc. Price* 18*s*.

China—Shantung. *Beiträge Kolonialpolitik* 5 (1903–1904): 10–17. **Maercker.**
Die hauptsächlichsten Ausfuhrartikel Schantungs. Von Hauptmann Maercker.

China—Trade. ———
China. Imperial Maritime Customs. 1.—Statistical Series: Nos. 3 and 4. Returns of Trade and Trade Reports for the year 1902. Part i.—Report on the Trade of China, and Abstract of Statistics. Shanghai: Kelly & Walsh; London: P. S. King & Son. 1903. Size 11 × 9, pp. 34.

China—Wei-Hai-Wei. **Bruce-Mitford.**
The Territory of Wei-Hai-Wei, a descriptive Guide and Handbook, with Maps and Illustrations, a Historical Note and Appendix. By C. E. Bruce-Mitford. Shanghai: Kelly & Walsh, [1902]. Size 7½ × 5, pp. 52.

This little book will do much to make the territory of Wei-hai-Wei better known to the British public.

China—Yangtse. *B.S.G. Com. Paris* 25 (1903): 373–381. **Hourst.**
Mission Hourst Sur le fleuve Bleu. Premier voyaye d'une canonnière française sur le Yang-tseu et ses rapides. Par M. le lieutenant Hourst.

See note in the Monthly Record for August (p. 211).

Chinese Empire—Tibet. **Launay.**
Société des Missions-Étrangères. Histoire de la Mission du Thibet. Par Adrien Launay. 2 vols. Lille & Paris: Desclée, de Brouwer & Cie., [n.d.]. Size 10 × 6½, pp. (vol. i.) viii. and 470; (vol. ii.) 440. *Map and Plates. Price* 12*s*.

French Indo-China. *Nouv. Archives Miss. Sci. et Lit.* 10 (1903): 145–166. **Barthélemy.**
Rapport sur une mission scientifique en Annam et au Laos (région de Xieng-Khouang). Par M. le comte de Barthélemy. *With Map.*

French Indo-China. *B.S.G. Com. Paris* 25 (1903): 329–363. **Lubanski.**
L'Indo-Chine française en 1902. Par M. le lieutenant-colonel Lubanski.

French Indo-China. *Rev. G.* 53 (1903): 54–68. **Mury.**
L'épopée Pavie. Trente années a travers l'Indo-Chine et le Siam. Par F. Mury.

India—Bengal. *J. Asiatic S. Bengal* 72 Pt. II. (1903): 24–56. **Little.**
On two remarkable rain-bursts in Bengal; and some of the more prominent features of the monsoon season in Northern India in 1902. By C. Little.

India—Botany. **Duthie.**
Flora of the Upper Gangetic Plain, and of the adjacent Siwalik and Sub-Himalayan Tracts. By J. F. Duthie. Vol. i. Part i. Ranunculaceæ to Cornaceæ. Calcutta: Office of the Superintendent of Government Printing, India, 1903. Size 7 × 5½, pp. xviii. and 404. *Map. Presented by the Indian Government.*

India—Bundelkhand. *J. Asiatic S. Bengal* 71 Pt. 1 (1902): 99–135. **Silberrad.**
A Contribution to the History of Western Bundelkhand. By C. A. Silberrad.

India—Historical. *J. United Service I. India* 32 (1903): 207–243. **Burton.**
Invasions of India. By Major R. G. Burton. *With Maps and Portraits.*

India—Nepal. *J. Asiatic S. Bengal* 72 Pt. 1 (1903): 1–32. **Bendall.**
The History of Nepal and surrounding Kingdoms (1000–1600 A.D.). Compiled chiefly from MSS. lately discovered. By Prof. C. Bendall. Written as an Historical Introduction to Pandit Haraprasād S'āstri's Catalogue of the Nepal Durbar Library. With chronological Tables and a Plate.

India—Surveys. **Gore.**
Extracts from Narrative Reports of the Survey of India for the season 1900–1901. Prepared under the direction of Colonel St. G. C. Gore, C.S.I. Calcutta, 1903. Size 13½ × 8½, pp. 68. *Presented by the Surveyor-General of India.*

India—Surveys. ———
Extracts from Narrative Reports of the Survey of India for the Season 1900–1901. Prepared under the direction of Col. St. G. C. Gore. Calcutta, 1903. Size 13 × 8½, pp. 68. *Price* 2*s*. 3*d*. *Presented by the Surveyor-General of India.*

This will be specially noticed.

Malay States. **Treacl**

Federated Malay States. Annual Report for 1902. By **W. H. Treacher.** Kual
Lumpur, 1903. Size 13½ × 8½, pp. 26. *Diagrams.*

Persia. **Syl**

Trade of Kerman Consular District for the year 1902-03. Foreign Office, Annua
No. 3032. Size 10 × 6½, pp. 8. *Price ½d.*

Philippine Islands. *B. American G.S.* **35** (1903): 253-260. **Tow**

The Climate of the Philippines. By W. S. Tower.

Russia—Siberia. **Bogo**

Publ. Musée d'Anthrop., etc., A. Imp. Sci. St.-Pétersbourg **2** (1901): pp. 68.

Aperçu sur l'Ethnographie des Tchouktches d'après les collections de N. L
Gondatti du Musée Ethnographique de l'Académie Impériale des Sciences de S.
Pétersbourg. Par W. H. Bogoraz. [In Russian.] *With Plates.*

Russian—Central Asia. **Meal**

In Russian Turkestan. A Garden of Asia and its People. By **Annette M. B**
Meakin. London: George Allen, 1903. Size 7½ × 5, pp. xviii. and 316. *Ma*
and Illustrations. Price 7s. 6d. net. Presented by the Author.

Russian Central Asia—Lake Aral. *Petermanns M.* 49 (1903): 126-127. **Friederichs**

Der Aral-See nach L. Berg's Forschungen. Von Dr. **M. Friederichsen.** *Map.*

Cf. note and map in the *Journal* for April, 1902.

Turkey—Asia Minor. *Petermanns M.* **49** (1903): 130-134. **Fitz**

Erdbebenbeobachtungen in Kleinasien. Von Dr. R. Fitzner.

AFRICA.

Abyssinia—Historical. *Rendiconti R.A. Lincei* **12** (1903): 177-201, 239-262. **Ross**

Gli atti di Abbā Yonās. Nota di Conti Rossini Carlo.

The "Acts of Yonas" are contained in an eighteenth-century manuscript, preser
in an Abyssinian church. The only copy known in Europe, now in the British Muse
is of later date. Portions of the text are here reproduced, with notes and translatio

Algeria. *Le Globe, B.S.G. Genève* **42** (1903): 114-118. **Ch**

Souvenirs d'une excursion à bicyclette dans le désert au Sud de Biskra. Par Prof
É. Chaix.

Algeria. *Nouv. Archives Miss. Sci. et Lit.* 10 (1903): 1-143. **Gs**

Enquête administrative sur les travaux hydrauliques anciens en Algérie. Par S
Gsell. *With Maps.*

Algeria—Biskra. **Tri**

Beautiful Biskra, "The Queen of the Desert." By **C. Howard Tripp.** Derby
London, and Watford: Bemrose & Sons, 1903. Size 8 × 6, pp. 94. *Map an*
Illustrations. Price 1s. net. Presented by the Publishers.

Account of a winter visit.

Algeria—Bona. **Fen**

Important Handbook for Travellers, Yachtsmen, and Officers of the Royal Navy i
Bona and neighbourhood. By Frank X. Fenick. Liverpool: Rockliff Bros., Ltd
Printers, 1902. Size 5 × 3, pp. 46. *Map, Chart, and Illustrations.*

Algeria—Rainfall. *Ann. G.* **12** (1903): 324-338. **Gauck**

La Pluie à Alger. Par P. Gauckler. *With Diagrams.*

Algerian Sahara. *Ann. G.* **12** (1903): 363-365. **Gaut**

Lettre sur le Mouydir et l'Ahnet. Par É. F. Gautier.

See note in the Monthly Record, *ante*, p. 700.

British Central Africa. **Pea**

Africa, No. 13 (1903). Report on the Trade and General Conditions of the Britis
Central Africa Protectorate for the year 1902-1903. By **Major F. B. Pearce**
Acting Commissioner. London: Eyre & Spottiswoode, 1903. Size 13½ × 8½, pp. 9
Map and Diagram. Price 1s. 3d.

Will be noticed in the Monthly Record.

British East Africa—Uganda Railway. ——

Africa. No. 12 (1903). Report by the Mombasa-Victoria (Uganda) Railway Committee on the Progress of the Works and Revenue working, 1902–1903. London: Eyre & Spottiswoode, 1903. Size 13 × 8½, pp. 22. *Maps. Price* 1*s.* 1*d.*

Canary Islands. *B.R.S.G. Madrid* **44** (1902): 639–643. **González.**

Reflexiones acerca del origen del suelo canario. Par J. M. González.

Central Sudan. *Rev. G.* **53** (1903): 4–13. **Destenave.**

Deux années de commandement dans la région du Tchad. Par Lieut.-Colonel Destenave.

Central Sudan. *Ann. G.* **12** (1903): 339–356. **Destenave and Dubois.**

Bas Chari, rive Sud du Tchad et Bahr el Ghazal, avec une introduction de Lieutenant-Colonel G. Destenave, et une carte. Par le Capitaine R. Dubois.

Central Africa. **Johnson.**

Sport on the Blue Nile; or, Six Months of a Sportsman's Life in Central Africa. By Isaac Charles Johnson, junr. London: R. Banks & Son, 1903. Size 9 × 5½, pp. 256. *Illustrations. Price 7s. 6d. net. Presented by the Publishers.*

This is almost entirely devoted to sporting adventures, though some of the photographs give a fair idea of the nature of the country traversed.

Sokotra and Abd-el-Kuri. **Forbes.**

The Natural History of Sokotra and Abd-el-Kuri. Being the Report upon the Results of the Conjoint Expedition to these Islands in 1898–9. By Mr. W. R. Ogilvie-Grant, of the British Museum, and Dr. H. O. Forbes, of the Liverpool Museums, together with information from other available sources, forming a Monograph of the Islands. Edited by H. O. Forbes. Liverpool: Free Public Museums, and H. Young & Sons, 1903. Size 10 × 6, pp. xlviii. and 598. *Map, Plates, and Illustrations. Presented by the Editor.*

This finely got-up work reflects great credit on the Liverpool Museums, as a special volume of whose *Bulletin* it appears. Although mainly dealing with systematic zoology and botany, the narrative of the expedition contains much that is valuable from a geographical point of view.

Somali Language. **Kirk.**

Notes on the Somali Language, with examples of Phrases and Conversational Sentences. By J. W. C. Kirk. London: H. Frowde, 1903. Size 6 × 4, pp. xii. and 84. *Presented by Sir John Kirk.*

This should be most useful to officers and others whose duties take them to Somaliland. It consists of words and phrases noted down by the author during the recent military operations, with a brief sketch of the main rules of syntax.

South Africa. *Nineteenth Century* **54** (1903): 391–403. **Brabant.**

The Resources of South Africa. By General Sir E. Brabant, K.C.B.

Tripoli. *L'Esploraz. Com.* **18** (1903): 210–215. **Mamoli.**

In Tripolitania. P. Mamoli.

West Africa. *B. Comité l'Afrique Française* **13** (1903).: 251–256. **Delafosse.**

La délimitation de la frontière entre la Côte d'Ivoire et le 2^e territoire militaire et la Côte d'Or anglaise. Par Maurice Delafosse. *With Map.*

West Africa—Bornu. *Deutsch. Kolonialzeitung* **20** (1903): 300–301. ——

Niger-Benuë-Tschadsee-Expedition. Reise nach Bornu. *With Map.*

See note in the Monthly Record for November (p. 568).

White Nile. *J. African S.* **2** (1903): 375–379. **Stanton.**

The Great Marshes of the White Nile. By Lieut.-Col. E. A. Stanton. *With Map.*

NORTH AMERICA.

Canada. *J. Geology* **11** (1903): 239–282. **Adams.**

The Monteregian Hills—a Canadian Petrographical Province. By F. D. Adams. *With Maps and Illustrations.*

Canada. ——

Geological Survey of Canada. Annual Report. (New Series.) Volume xii. Reports A, B, C, G, I, J, M, O, R, S. 1899. Ottawa: S. E. Dawson, 1902.

Size 9½ × 6½, pp. xvi. 224, 48, 36, 78, 92, 144, 42, 84, 64, 144, and xxiv. *Maps and Illustrations. Price* 80 *cents. Presented by the Geological Survey of Canada.*

Among the more important reports—in addition to the general report on the work of the survey—are those by Mr. Gwillim on the Atlin mining district of British Columbia, and by Mr. J. M. Bell on the region of the Great Bear and Great Slave lake districts (cf. *Journal*, vol. xviii. p. 249). A map of the Klondike goldfields is given.

Canada—British Columbia. **Ridley.**

Snapshots from the North Pacific. Letters written by Bishop Ridley, of Caledonia. Edited by Alice J. Janvrin. London: Church Missionary Society, 1903. Size 7½ × 5, pp. viii. and 192. *Map and Illustrations. Price* 1*s.* 6*d. net. Presented by the Publishers.*

Sketches of travel and mission work in the outlying districts of British Columbia.

Canada—Rocky Mountains. *Alpine J.* **21** (1903): 464–475. **Outram.**

The First Ascent of Mount Bryce. By Rev. J. Outram. *With Illustrations.*

United States. **Atkinson.**

Sheep upon the Upland Cotton Fields, and some other matters. An address . . . by Edward Atkinson. Boston, 1903. Size 9 × 6, pp. 32. *Presented by the Author.*

United States—California. **Anderson and Grinnell.**
P.A. Nat. Sci. Philadelphia **55** (1903): 4–15.

Birds of the Siskiyou Mountains, California: a Problem in Distribution. By M. P. Anderson and J. Grinnell.

United States—Klamath Mountains. **Diller.**
B. United States Geolog. Surv., No. 196 (1902): pp. 70.

Topographic Development of the Klamath Mountains. By J. S. Diller. *With Map and Illustrations.*

United States—Maryland. **Sioussat.**

Economics and Politics in Maryland, 1720–1750, and the Public Services of Daniel Dulany the Elder. By St. George Leakin Sioussat, PH.D. (Johns Hopkins University Studies, Series xxi. Nos. 6–7.) Baltimore, 1903. Size 10 × 6, pp. 84.

United States—Minerals. **Day.**

Department of the Interior. United States Geological Survey. Mineral Resources of the United States. Calendar year, 1901. By David T. Day. Washington, 1902. Size 9 × 6, pp. 996. *Presented by the U.S. Geological Survey.*

United States—Missouri. *Meteorolog. Z.* **20** (1903): 307–314. **Drapczynski.**

Ueber die Verteilung der meteorologischen Elemente in der Umgebung der Barometer-Minima und -Maxima zu St. Louis in Missouri, Vereinigte Staaten von Nordamerika. Von Dr. V. Drapczynski.

United States—Place-names. **Gannett.**
B. United States Geolog. Surv., No. 197 (1902): pp. 280.

The origin of certain place-names in the United States. By H. Gannett.

United States and Cuba. ——
Monthly B. Int. Bureau American Rep. **15** (1903): 67–70.

Treaties between the United States and Cuba.

CENTRAL AND SOUTH AMERICA.

Brazil. *B.S.G. Com. Paris* **25** (1903): 382–392. **Le Cointe.**

La forêt amazonienne. Par Paul Le Cointe.

The author tries to correct popular ideas as to the nature of the Amazonian forest.

Brazil and Central America. **Poisson.**
Nouv. Archives Miss. Sci. et Lit. 10 (1903): 279–307.

Rapport sur une mission scientifique au Brésil, aux Antilles et au Costa-Rica. Par E. Poisson.

The mission was undertaken for the study of the caoutchouc-yielding and other economic plants of the countries visited.

Brazil—Meteorology. *Sitzb. K.A.W. Wien* **111** (Abth. IIa.) (1902): 615–683. **Hann.**

Zur Meteorologie des Äquators. Nach den Beobachtungen am **Museum Goeldi** in Pará. Von J. Hann.

Dutch Guiana. *Tijds. K. Ned. Aard. Genoots. Amsterdam* **20** (1903): 737–740. **Hasselt.**
Goninie-expeditie. Door J. H. van Hasselt.

This expedition, which has been organized during the summer of 1903, is under the command of Lieut. A. F. Herderschee.

French Guiana. *B.S.G. Com. Paris* **25** (1903): 407–415. **Hesse.**
La Guyane française au point de vue économique. Par G. Hesse.

Mexico—Tabasco. *B.R.S.G. Madrid* **45** (1903): 7–106. **Uncilla.**
Tabasco en la época precolombiana. Por S. Doporto y Uncilla.

Peru. *J. Manchester G.S.* **18** (1902): 153–162. **Portillo and Guillaume.**
The Peruvian Amazonian Basin, with its Prospects for Commerce and Colonization. Translated from Notes by Col. Pedro Portillo by Mons. H. Guillaume. *With Illustrations.*

AUSTRALASIA AND PACIFIC ISLANDS.

New Guinea—British. *J. Anthrop. I.* **33** (1903): 108–124. **Chalmers.**
Notes on the Bugilai, British New Guinea. By the late Rev. James Chalmers.
A Vocabulary of the Bugi Language, British New Guinea. By the same.
Notes on the Natives of Kiwai Island, Fly River, British New Guinea. By the same.

New Guinea—British. *J. Anthrop. I.* **33** (1903): 125–134. **Holmes.**
Notes on the Elema Tribes of the Papuan Gulf. By the Rev. J. H. Holmes.

New Guinea—Dutch. ——
Tijds. K. Ned. Aard. Genoots. Amsterdam **20** (1903): 719–728.
Nieuw-Guinea expeditie. *With Map.*

New Zealand—Alps. *Alpine J.* **21** (1903): 475–479. **Macdonald.**
A Month's Holiday in the Mount Cook District, New Zealand. By C. A. Macdonald. *With Illustrations.*

Queensland—Almanac. **Slater.**
Slater's Queensland Almanac, Directory, and Gazetteer for 1903. Brisbane: Gordon & Gotch. Size 9 × 5½, pp. xii. and 220. *Price* 1*s.*

Tasmania. *Papers and P.R.S. Tasmania* (1902): 138–142. **Legge.**
Contribution to the Physiography of Tasmania. By Colonel W. V. Legge. *With Plate.*

Tasmania—Astronomy. *Papers and P.R.S. Tasmania* (1902): 85–94. **McAulay.**
Practical Astronomy in Tasmania, and a proposal for a school thereof. By Prof. A. McAulay.

Tasmania—Timber. *Papers and P.R.S. Tasmania* (1902): 35–76. **Green.**
The Timber Industry. By A. O. Green. *With Illustrations.*

Western Australia. **Campbell.**
Notes on the Auriferous Reefs of Cue and Day Dawn. By W. D. Campbell. (Western Australia, Geological Survey, Bulletin No. 7.) Perth, 1903. Size 8½ × 5½, pp. 38. *Map (separate). Presented by the Geological Survey, W. Australia.*

Western Australia. **Fraser.**
Seventh Census of Western Australia, taken for the Night of March 31, 1901. Compiled under the direction of Malcolm A. C. Fraser. Volume ii. Detailed Tables. Perth, 1903. Size 13 × 8½. *Diagram. Presented by the Superintendent of the Census.*

POLAR REGIONS.

Antarctic. **Balch.**
Antarctica. By E. S. Balch. Philadelphia: Allen, Lane, & Scott, 1902. Size 11 × 7, pp. 230. *Maps. Presented by the Author.*

See review in vol. xxi. p. 525.

Antarctic. **Drygalski and others.**
Die Deutsche Südpolar-Expedition auf dem Schiff "Gauss" unter Leitung von Erich von Drygalski. Bericht über die wissenschaftlichen Arbeiten seit der Abfahrt von Kerguelen bis zur Rückkehr nach Kapstadt, 31. Januar 1902 bis 9. June 1903,

und die Tätigkeit auf der Kerguelen-Station vom 1. April 1902 bis 1. April 1903 mit Beitragen von Bidlingmaier, v. Drygalski, Gazert, Luyken, Ott, Philippi, Ruser, Stehr, Vahsel, Vanhöffen. (Veröffentlichungen des Instituts für Meereskunde und des Geographischen Instituts an der Universität Berlin, Heft 5, Oktober 1903.) Berlin: E. S. Mittler & Sohn. Size 10 × 7, pp. iv. and 182. *Maps.*

Antarctic—Meteorology. **Arçtowski.**

Henryk Arçtowski. Le Pole de froid. (Extrait du No. 6 [1903] du *Bulletin de la Société Belge d'Astronomie.*) Bruxelles. Size 9½ × 6½, pp. 6.

Discusses the observations of the British Expedition.

Antarctic—Swedish Expedition. *Ymer* **23** (1903): 200–208. **Nathorst.**

Den svenska antarktiska undsättnings-expeditionen. Af A. G. Nathorst.

Arctic Ocean. **Varnek.**

A. T. Varnek. Short sketch of the work of the Hydrographical Expedition in the Arctic Ocean, in 1902. [In Russian.] St. Petersburg, 1903. Size 10 × 7, pp. 36. *Map.*

Will be noticed in the Monthly Record.

PHYSICAL AND BIOLOGICAL GEOGRAPHY.

Anthropology—Catalogue. ——

International Catalogue of Scientific Literature. First Annual Issue. P. Physical Anthropology. Published for the International Council by the Royal Society of London. London: Harrison & Sons, 1903. Size 8½ × 5½, pp. xiv. and 224. *Price* 10*s*. 6*d*.

Coral Reefs. *American J. Sci.* **16** (1903): 203–213. **Gardiner.**

The Origin of Coral Reefs as shown by the Maldives. By J. S. Gardiner.

Geology. **Geikie.**

Text-Book of Geology. By S. Archibald Geikie. 4th Edition, Revised and Enlarged. 2 vols. London & New York: Macmillan & Co., 1903. Size 9½ × 6, pp. xxii., x., and 1472. *Illustrations. Price* 30*s. net. Presented by the Publishers.*

The new matter added in this edition amounts to 300 pages, bringing the total to over 1400.

Geology. *Geolog. Mag.* **10** (1903): 433–450. **Watts.**

The Functions of Geology in Education and Practical Life. By Prof. W. W. Watts.

Glaciers. *J. Geology* **11** (1903): 285–288. **Reid.**

The Variation of Glaciers. VIII. By H. F. Reid.

A summary of the Sixth Annual Report of the International Committee on glaciers.

Meteorology. *Symons's Meteorolog. Mag.* **38** (1903): 139–141. **Aldridge.**

Curves of Monthly Mean Temperatures for Verkhoyansk (Siberia), the Sonnblick (Austrian Alps), Ben Nevis, Ross, and the Scilly Isles. By E. G. Aldridge. *With Diagram.*

Seismology. *B.S. Belge Géologie* **17** (1903): 11–37. **Van den Broeck.**

Nouvelle théorie de l'explosion volcanique basée sur la combinaison des vues de M. O. van Ertborn avec les expériences et thèses de MM. A. Gautier et A. Brun et avec la théorie de M. A. Stübel. Par E. Van den Broeck.

Tides. *Nature* **68** (1903): 322. **Chapman.**

A Simple Form of Tide Predictor. By R. W. Chapman. *With Illustrations.*

Zoology. **Theobald.**

British Museum (Natural History). First Report on Economic Zoology. By Fred. V. Theobald. London, 1903. Size 10 × 6, pp. xxxiv. and 192. *Illustrations. Presented by the Trustees, British Museum.*

ANTHROPOGEOGRAPHY AND HISTORICAL GEOGRAPHY.

Commercial Geography—Coal. *J.R. Statistical S.* **66** (1903): 439–533. **Thomas.**

The Growth and Direction of Our Foreign Trade in Coal during the last Half Century. By D. A. Thomas, M.P. *With Map and Diagram.*

Anthropogeography. **Woltmann.**

Politische Anthropologie. Eine Untersuchung über den Einfluss der Descendenztheorie auf die Lehre von der politischen Entwicklung der Völker. Von Ludwig Woltmann. Leipzig, 1903. Size 10½ × 7, pp. iv. and 326. *Price* 6s.

Discusses the influence of race, etc., on political evolution.

Historical—Juan de Garay. **Outes.**

Félix F. Outes. Don Juan de Garay, circumstancias que rodearon su muerte. Estudio histórico-geográfico. Buenos Aires, 1903. Size 10½ × 6½, pp. 42. *Sketch-Maps. Presented by the Author.*

Historical—Map. *B.R.S.G. Madrid* **44** (1902): 634-638. **Vera.**

Un mapa-mundi español del siglo XVI. Por Vicente Vera.

On the map lately discovered by Mr. Voynich (see *Journal*, vol. xx. p. 345), with notes on Spanish map-makers of the century.

Historical—The East. **Marquart.**

Osteuropäische und ostasiatische Streifzüge. Ethnologische und historisch-topographische Studien zur Geschichte des 9. und 10. Jahrhunderts (ca. 840-940). Von J. Marquart. Leipzig: T. Weicher, 1903. Size 9 × 6, pp. l. and 558. *Price* 30s.

History of Geography. **Berger.**

Geschichte der wissenschaftlichen Erdkunde der Griechen. Von Hugo Berger. Zweite Auflage. Leipzig: Veit & Co., 1903. Size 9½ × 6½, pp. iv. and 662.

See note, *ante*, p. 695.

BIOGRAPHY.

King. **[Walcott.]**

Necrology. Clarence King. (Twenty-third Annual Report of the United States Geological Survey. Washington, 1902. Pp. 198-206.) *Portrait.*

Schurtz. *Deutsch. G. Blätter* **26** (1903): 51-63. **Ratzel.**

Heinrich Schurtz. Von Prof. F. Ratzel.

H. Schurtz was born in 1863, and died in May, 1903. He was formerly a pupil of Prof. Ratzel, and was a copious writer on subjects connected with Anthropogeography.

Sprengel. *M.V. Erdk. Halle* (1903): 1-56. **Hänsch.**

Matthias Christian Sprengel, ein geographischer Publizist am Ausgange des 18. Jahrhunderts. Von Dr. B. F. Hänsch.

GENERAL.

Belgian Geographical Society. ———

La Fondation de la Société Royale Belge de Géographie et son XXV^{me} Anniversaire. Bruxelles: 1903. Size 10 × 6½, pp. 188. *Portraits. Presented by the Société Royale Belge de Géographie.*

Missionary Report. ———

Proceedings of the Church Missionary Society for Africa and the East. One hundred and fourth year, 1902–1903. Containing the Anniversary Sermon by the Right Rev. Francis James Chavasse, D.D., The Annual Report of the Committee. London, 1903. Size 8½ × 5½, pp. xcvi., 72, and 426. *Maps. Presented by the Church Missionary Society.*

Mosquitoes. **Theobald.**

A Monograph of the Culicidæ, or Mosquitoes. Mainly compiled from the collections received at the British Museum from various parts of the world in connection with the Investigation into the cause of Malaria conducted by the Colonial Office and the Royal Society. By Fred. V. Theobald. Vol. iii. London: British Museum (Natural History), 1903. Size 8½ × 5½, pp. xviii. and 360. *Plates, Diagram, and Illustrations. Presented by the Trustees, British Museum.*

Tsetse-Fly. **Austen and Hansen.**

A Monograph of the Tsetse-Flies. [Genus Glossina, Westwood.] Based on the Collection in the British Museum, by Ernest Edward Austen; with a chapter on mouth-parts by H. J. Hansen. London: British Museum (Natural History), 1903. Size 10 × 6, pp. x. and 320. *Map, Plates, and Illustrations. Presented by the Trustees, British Museum.*

NEW MAPS.

By E. A. REEVES, *Map Curator*, R.G.S.

EUROPE.

Denmark. **Danish General Staff.**

Generalstabens topografiske Kaart over Danmark. Scale 1 : 40,000 or 1·5 inch to a stat. mile. Sheets—Frederikshavn, Hörmæsted, Hjöring, Aalbæk, Iversted, Hirshals, Skagen, Læsö N.V.D., Læsö N.Ö.D., Læsö S.V.D., Læsö S.Ö.D. Copenhagen, 1903. *Presented by the Danish Government.*

England and Wales. **Bartholomew.**

The Survey Atlas of England and Wales. A series of eighty-four plates of maps and plans, with Descriptive Text, illustrating the Topography, Physiography, Geology, Climate, and the Political and Commercial Features of the Country. Designed and prepared under the direction of J. G. Bartholomew, F.R.S.E., F.R.G.S. Parts vii., viii., ix., and x. Edinburgh: John Bartholomew & Co. Under the patronage of the Royal Geographical Society, 1903. *Price* 2*s*. 6*d*. *each part. Presented by the Publishers.*

The following are the contents of these parts:—Part vii. Text—The Cartography of England and Wales. Plates: 4, Monthly Rainfall Maps; 5, Monthly Temperature Maps; 82, Plans of Newcastle, Hull, Bradford, and Leeds; 84, Plans of Bristol, Portsmouth, Plymouth, and Brighton.—Part viii. Sections of the 2-miles-to-an-inch map of England and Wales. Plates: 19, Whernside and Penyghent; 20, Ripon and Northallerton; 21, Scarborough; 22, Hull and Hornsea.—Part ix. Plates: 38, Carnarvon; 39, Aberystwith; 77, New Quay and Bodmin; 78, Lands End and Falmouth.—Part x. Taunton and Exmoor. Plates: 67, Ilfracombe and Barnstaple; 75, Dartmoor and Torquay; 76, Bodmin and Plymouth.

This list of maps of England and Wales, which Mr. Bartholomew gives in Part vii., contains the titles of the more important maps from the earliest times to the present date, and will be useful for reference, especially as the library where each map can be consulted is stated. The meteorological maps in the same part are also worthy of special attention.

England and Wales. **Ordnance Survey.**

ORDNANCE SURVEY OF ENGLAND AND WALES:—Sheets published by the Director-General of the Ordnance Survey, Southampton, from October 1 to 31, 1903.

2 miles to 1 inch:—

Printed in colours, 62, 80, 82, 98, 1*s*. *each;* folded in covers or flat in sheets.

1 inch:—

(First revision) with hills in brown or black, 10, 32, 33, 39, 40, 42, 59, 61, 67, 1*s*. *each* (engraved).

(Second revision) in outline, 267, 283, 300, 302. 1*s*. *each* (engraved).

Printed in colours (74 and 83, part of) (combined). 1*s*.

6-inch—County Maps (first revision):—

Cambridgeshire, 47 S.E., 54 S.E., 57 S.W., 58 S.W. **Dorsetshire**, 29 S.W. **Gloucestershire**, 24 N.W., 25 N.W., 26 N.E., 31 N.E., 39 N.E., S.E., 40 S.E., 42 N.W., 47 S.E., 51 N.E., 58 N.W., 64 N.W., 67 S.W., 69 N.W., N.E., 70 N.W., 73 N.E. **Leicestershire**, 24 S.W., 28 N.W., S.E., 29 N.W., 34 N.E., 35 N.W., N.E., 36 N.W. **Radnorshire**, 15 N.E. **Shropshire**, 52*a* N.W., 70 S.W., 71 N.W., 73 S.W., S.E., 76 N.E. **Somersetshire**, 7 S.E., 12 N.W., 13 S.W., 17 N.W., 18 S.E., 73 N.W., 87 N.W., S.E. **Staffordshire**, 49 S.W., 59 S.E., 60 N.W., 61 N.E., S.E., 65 N.E., 67 S.W. **Warwickshire**, 2 S.E., 3 N.W., S.E., 5 N.E., 6 N.E. **Wiltshire**, 12 N.W., 18 N.E. **Worcestershire**, 9 N.E., 21 N.E., 22 N.E. (First revision of 1891 survey), **Yorkshire**, 284 S.W. 1*s*. *each*.

25-inch—County Maps (first revision):—

Dorsetshire, V. 12, 14, 16; XI*a*. 16; XX. 8, 10; XXVII. 4, 16; XXVIII. 1, 2, 5, 6, 9, 10, 11, 13, 14, 16; XXIX. 5; XXXVII. 2, 7, 10. **Gloucestershire**, XXIV. 7; LXVII. 2, 6, 7; LXXII. 9, 10, 11, 15; LXXIII. 1, 9, 13; LXXV. 4. **Herefordshire**, II. 8, 9, 13, 15, 16; III. 9, 13, 14, 15; V. 4, 8, 12, 15, 16; VI. 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 14, 15; VII. 2, 3, 5, 6, 7, 8, 9, 10; VIII. 5; X. 6, 7, 8; XI. 1, 3, 6, 9; XIV. 10. **Leicestershire**, XI. 15, 16; XII. 4, 8, 12; XVII. 12; XVIII. 3, 4, 6, 8, 12, 15, 16; XIX. 2, 5, 6; XXV. 15; XXIX. 15; XXX. 12, 14, 15, 16; XXXIV. 6, 11, 15, 16; XXXVI. 4, 8; XLI. 4; XLII. 4, 6; XLIII. 5, 13; XLVIII. 6, 15. **Radnorshire**, V. 13; IX. 3; X. 1, 6, 11, 12, 16; XI. 13; XII. 9, 13; XV. 1; XVII. 1, 4, 6, 7, 8, 10, 12, 14, 15, 16; XVIII. 2, 3, 4, 5, 6, 7, 8, 9, 10, 12, 15, 16;

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England and Wales. **Geological Survey.**

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Solid edition (261 and 262). **1s.** *6d.*

(*E. Stanford, London Agent.*)

Netherlands. **Geest.**

Het Koninkrijk der Nederlanden. Naar de Topografische kaart (1 : 50,000) en andere nieuwe bronnen ontworpen en geteekend door E. De Geest. Scale 1 : 300,000 or 4·7 stat. miles to an inch. 2 sheets and index. Amsterdam: Seyffardt's Boekhandel, 1903.

Novaya Zemlya. **Borissow.**

Borissows Aufnahmen in Nowaja Semlja im Winter 1901–2. Scale 1 : 300,000 or 4·7 stat. miles to an inch. *Petermanns Geographische Mitteilungen.* Jahrang 1903, Taf. 22. Gotha: Justus Perthes. *Presented by the Publishers.*

ASIA.

Asia. **Stanford.**

A map of the countries between Constantinople and Calcutta, including Turkey in Asia, Persia, Afghanistan, and Turkestan. Scale 1 : 6,969,600 or 110 stat. miles to an inch. London: Edward Stanford, 1903. *Price* 7s.

Stanford's Map of the Empires of China and Japan, with the adjacent parts of the Russian Empire, India, Burma, etc. Scale 1 : 6,969,600 or 110 stat. miles to an inch. London: Edward Stanford, 1903. *Price* 8s.

These two maps, taken from Stanford's library map of Asia, together extend from Constantinople to Japan. To a certain extent they overlap, the northern part of India being given on each map. Railways, working and proposed, are clearly shown in red, political boundaries are coloured, and other information is given that will render the maps useful for general reference in connection with all matters connected with the Far East.

Indian Government Surveys. **Surveyor-General of India.**

Indian Atlas, 4 miles to an inch. Sheets: 9 S.W., parts of district Hyderabad and Native State of Khairpur (Sind, Bombay Presidency), additions to 1901. 22 N.E., parts of districts Ahmedabad, Kaira, and Panch Mahals, of Native State Baroda, and of Mahi Kantha, Rewa Kantha, and Kathiawar Agencies (Bombay Presidency), additions to 1902. 37 S.W., parts of districts Surat, Khandesh, and Nasik, Rewa Kantha, Surat, and Khandesh Agencies, and Native State Baroda (Bombay Presidency), additions to 1900. 49 S.E., parts of districts Gurgaon and Delhi (Punjab), Meerut, Bulandshahr, Muttra, Aligarh, and Moradabad (United Provinces of Agra and Oudh), additions to 1901. 60 S.E., parts of districts Mysore, Bangalore, Tumkur, and Kolar (Mysore), and of Salem and Coimbatore (Madras Presidency), additions to 1898. 67 N.E., parts of districts Bareilly, Naini Tal, Almora Pilibhit, and Kheri (United Provinces of Agra and Oudh), and Nepal (Native State), additions and corrections to 1902. 79 N.E., Pondicherri (French Territory), and parts of districts South Arcot, Tanjore, and Trichinopoli (Madras Presidency), 1903. 87 N.E., parts of districts Gonda, Bahraich, Basti, and Gorakhpur (United Provinces of Agra and Oudh), additions to 1901. 178 N.W., parts of district Mergui (Burma), 1903. 61, parts of districts Malabar, Coimbatore, Madura, and Salem (Madras Presidency), and of district Mysore (Mysore Native State), and Coorg, additions to 1902. 94, parts of districts Khamamet (Nizam's Dominions), of Kistna, Godavari, and Vizagapatam (Madras Presidency), and Bastar State

(Central Provinces), additions to 1900. 104, parts of districts Mirzapur (N.W. Provinces), Shahabad, Gaya, Hazaribagh, Ranchi, Palamau, and Sarguja State (Bengal), additions to 1902. 121, district Howrah and parts of districts 24 Parganas, Burdwan, Khulua, Nadia, Jessore, Faridpur, Backergunge, Midnapore, and Hooghly (Bengal), with additions to 1901.—Burma Survey, 1 mile to an inch. Sheets: (Preliminary Edition) 467 (N.S.), district Tavoy, Season 1891–93, 1901; 509 (N.S.), part of Southern Shan States, Season 1900–01, 1902; 541 (569 O.S.), district Mergui, Season 1890–91, 1901.—Central India and Rajputana Survey, 1 mile to an inch. Sheets: 209, parts of Banswara, Partabgarh (Rajputana Agency), and of Gwalior, Jaora, Rutlam, and Sailana (Central India Agency), Seasons 1879–81, 1901; 412, part of Gwalior (C.I.A.), Season 1862–63, with additions to roads and railways from extra departmental sources to September, 1902, 1903.—Madras Survey, 1 mile to an inch. Sheets: 29, parts of districts Hassan and Kadur (Mysore) and South Canara (Madras), Season 1879–81, with additions and corrections to February, 1890, 1902; 79 and 80, part of district Mysore (Mysore), Season 1884–85, with additions and corrections to 1902; 105, parts of districts Bangalore, Kolar, and Tumkur (Mysore), Season 1877–79, with additions to boundaries, railways, and roads from extra departmental source to July, 1890, 1903; 107 and 108, parts of districts Mysore, Bangalore, and Tumkur (Mysore), Season 1883–84, with additions and corrections to 1896, 1902; 109, parts of districts Bangalore and Mysore (Mysore), Season 1883–84, with additions and corrections to 1900, 1902; 137 and 171, parts of districts Bangalore and Kolar (Mysore), Seasons 1877–79, 1885–86, with additions and corrections to 1898, 1903; 172 and part of 204, parts of districts Kolar (Mysore) and Salem (Madras), Season 1885–86, with additions and corrections to July, 1899, 1902.—Punjab Survey, 1 mile to an inch. Sheets: 110, 111, 138, district of Rawulpindi, 1902; 164, 165, 188, 189, district of Jhilam, 1902; (Second Edition) 290, districts Hoshiapur, Umballa, and Simla, Patiala and Simla Hill States, Season 1886–89, 1903.—Punjab and United Provinces of Agra and Oudh Surveys, 1 mile to an inch. Sheet (Second Edition) 315 (Punjab), 2 (U.P.A. & O.) districts Umballa and Karnal and Kalsia State (Punjab), and district Saharanpur (U.P.A. & O.), Seasons 1878–80 and 1886–88, 1902.—Sind Survey, 1 mile to an inch. Sheet (Second Edition) 38, districts Shikarpur, Upper Sind Frontier, and Larkhana, and part of Kalab (Baluchistan), Seasons 1897–98 and 1899–1900, 1902.—South-Eastern Frontier, 4 miles to an inch. Sheet 12 N.W., China, Yün-nan Province, Seasons 1894–95, 1898–1900, 1902.—United Provinces of Agra and Oudh Survey, 1 mile to an inch. 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(North-Western Trans-Frontier Series), Season 1880–81, 1902.—Index to the Standard Sheets of Bengal, 50 miles to an inch, additions to 1901.—Index to the Standard Sheets of the Bombay Presidency, 65 miles to an inch, additions to 1901.—Index to the Degree Sheets of Burma, 65 miles to an inch, 1903.—Index to the Standard Sheets of Burma (New Series), 64 miles to an inch, additions and corrections to boundaries, etc., up to 1902, 1903.—Andaman Survey, 2 miles to an inch. Sheets: 1, part of South Andaman, Season 1885–86, 1902; 3 and 11, Little Andaman, Seasons 1885–87, 1903; 5 and 6, North Andaman, Season 1885–86, 1902; 7, part of North and Middle Andaman, Season 1885–86, 1902; 8, South and Middle Andaman, Season 1884–85, 1902; 9, South Andaman, Season 1883-86, 1902; 10, part of South Andaman, Season 1885-1886, 1902.—Assam Survey, 1 mile to an inch. 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Sheets: 73 (Preliminary Edition), 90 (Old Series), district Minbu, Seasons 1892-93, 1896-98, 1901; 111 (Preliminary Edition, New Series), districts Minbu and Magwe, Seasons 1891-3, 1894-95, 1902; 140, 141, and 188 (Preliminary Edition; New Series), district Katha, Seasons 1893-94 and 1896-97, 1903; 143 (Preliminary Edition, New Series), district Shwebo, Seasons 1892-96, 1901; 161 (Second Edition), 179 (Old Series), parts of districts Prome and Thayetmyo, Seasons 1882-93 and 1898-1901, 1903; 237 and 238 (New Series), parts of districts Shwebo, Ruby Mines, and Northern Shan States, Season 1900-01, 1903; 246 (Second Edition), parts of districts Meiktila, Kyaukse, and Southern Shan States, Seasons 1889-91 and 1898-1901, 1903; 250 (Preliminary Edition, New Series), district Yamethin and Southern Shan States, Seasons 1894-97 and 1900-01, 1902; 301 (Preliminary Edition, New Series), districts Tungu, Seasons 1897-99, 1901; 438 (New Series), parts of Northern and Southern Shan States, Season 1900-01, 1902. *Presented by H.M. Secretary of State for India, through the India Office.*

Indo-China. **Bureau Topographique des Troupes de l'Indo-Chine.**

Carte de l'Indo-Chine. Scale 1 : 500,000 or 7·8 stat. miles to an inch. Sheets: Cao Bang, Hanoi, Luang Prabang. Bureau Topographique des Troupes de l'Indo-Chine. *Price* $0.60 *each sheet.*

AFRICA.

Africa. **Intelligence Division, War Office.**

Africa. Scale 1 : 250,000 or 3·9 stat. miles to an inch. Egyptian Sudan. Sheets (Provisional): 66-O, Nasser; 66-P, Goré; 78-C, Akobo. Corrections to September, 1903. London: Intelligence Division, War Office; Stanford. 1903. *Price* 1*s.* 6*d. each sheet. Presented by the Director-General of Mobilization and Military Intelligence.*

These are new editions corrected up to September, 1903.

East Africa. **Wickenburg.**

Graf Eduard Wickenburgs Reiserouten in Ost-Afrika 1901. Scale 1 : 1,000,000 or 15·8 stat. miles to an inch. Blatt. iv. and v. *Petermanns Geographische Mitteilungen*, Jahrgang 1903, Taf. 19 and 20. Gotha: Justus Perthes. *Presented by the Publishers.*

These two sheets show that part of Count E. Wickenburg's journey through British East Africa from 4° N. lat., east of Lake Rudolf, southward to the Tana river just above Borati. A great part of the country traversed was previously unexplored, and Count Wickenburg's surveys are therefore important.

Kamerun. **Moisel.**

Das nordwestliche Grenzgebiet von Kamerun zwischen Rio-Del-Rey und Bali. Nach den neuen Aufnahmen von Hauptmann Glanning, Hauptmann Ramsay, Oberleutnant Lessner, Bezirksamtmann Dr. Meyer, Oberleutnant Strümpell und Leutnant Buthut (1900-1902) und dem gesamten älteren Material, bearbeitet von Max Moisel. Scale 1 : 259,000 or 3·9 stat. miles to an inch. Two Sheets. Berlin: Dietrich Reimer (Ernst Vohsen).

This map is based upon the recent explorations and surveys of German officers, combined with those of earlier travellers, and gives a good idea of what is at present known of the north-west boundary region of Kamerun. It is well drawn, and prin in colours.

Orange River Colony. **Dun**

Divisional Maps of the Orange River Colony. Scale 1 : 148,705 or 2·3 stat. miles to an inch. Compiled by A. H. Duncan for the Orange River Colony Surveyor-General's Office, Bloemfontein. April, 1902. Sheets: Bloemfontein, Kroonstad. Bloemfontein and London: Argus Printing & Publishing Co. *Price 7s. 6d. each sheet.*

These sheets have been compiled in the Surveyor-General's Office, Bloemfont from the farm surveys published by the Government of the late Orange Free Sta together with those of more recent date by British officers and all other availab material. They form part of a large map of the Orange River Colony in twenty-thr sheets, of which eighteen are now ready. Besides giving information respecting th areas and boundaries of farms, rivers and streams are shown in blue, and hills brown horizontal hachures. The sheets are lithographed by the Argus Company, Bloem fontein, and can be obtained from the offices of that company in London at pric varying from 7s. 6d. to 10s. 6d. each. Later on a more complete survey will doubtle be undertaken, but for the present this map will be of great service and importance.

AMERICA.

Canada. **Surveyor-General's Office, Ottaw**

Sectional map of Canada. Scale 1 : 190,080 or 3 stat. miles to an inch. Turtle Mountain Sheet (17), West of Principal Meridian, revised to August 14, 1903; Sullivan Lake Sheet (69), West of Fourth Meridian, revised to April 30, 1903; Calgary Sheet (83), West of Fifth Meridian, revised to June 4, 1903. Ottawa: Surveyor-General's Office, 1903. *Presented by the Surveyor-General of Canada.*

These sheets are new editions revised up to the present year. They show trail post-offices, townships, railways, and stations.

United States. **Boston and Maine Railro**

Bird's-Eye View from Summit of Mount Washington, White mountains, New Hampshire. A coloured lithograph issued by the Passenger Department, Boston and Maine Railroad, Boston, Mass. *Presented by E. G. Buttrick, Esq.*

GENERAL.

World. **Stiel**

Neue, neunte Lieferungs-Ausgabe von Stielers Hand-Atlas, 100 Karten in Kupferstich, 23 and 24 Lieferung. Gotha: Justus Perthes. *Price 60 pf. each part.*

Two parts in one cover, containing (Nos. 29 and 30) the south-west and south-ea sheets of a four-sheet map of France on the scale of 1 : 1,500,000, which have bee revised, and Nos. 46 and 47, two sheets of a new map of European Russia, on the sca of 1 : 3,700,000, by H. Kehnert and W. Habenicht.

CHARTS.

North Atlantic and Mediterranean. **Meteorological Offi**

Pilot Chart of the North Atlantic and Mediterranean for November, 1903. London: Meteorological Office. *Price 6d.* *Presented by the Meteorological Office, London.*

United States Charts. **United States Hydrographic Offi**

Pilot Charts of the North Atlantic Ocean for October and November, and of the North Pacific for November, 1903. U.S. Hydrographic Office, Washington, D.C. *Presented by the U.S. Hydrographic Office.*

N.B.—It would greatly add to the value of the collection of Phot graphs which has been established in the Map Room, if all the Fellow of the Society who have taken photographs during their travels, woul forward copies of them to the Map Curator, by whom they will b acknowledged. Should the donor have purchased the photographs, will be useful for reference if the name of the photographer and h address are given.

EXPEDITION TO CAUPOLICAN BOLIVIA.

EVANS.

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